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Including the Proceedings of the
AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XV NOVEMBER 15, 1926 NUMBER 19

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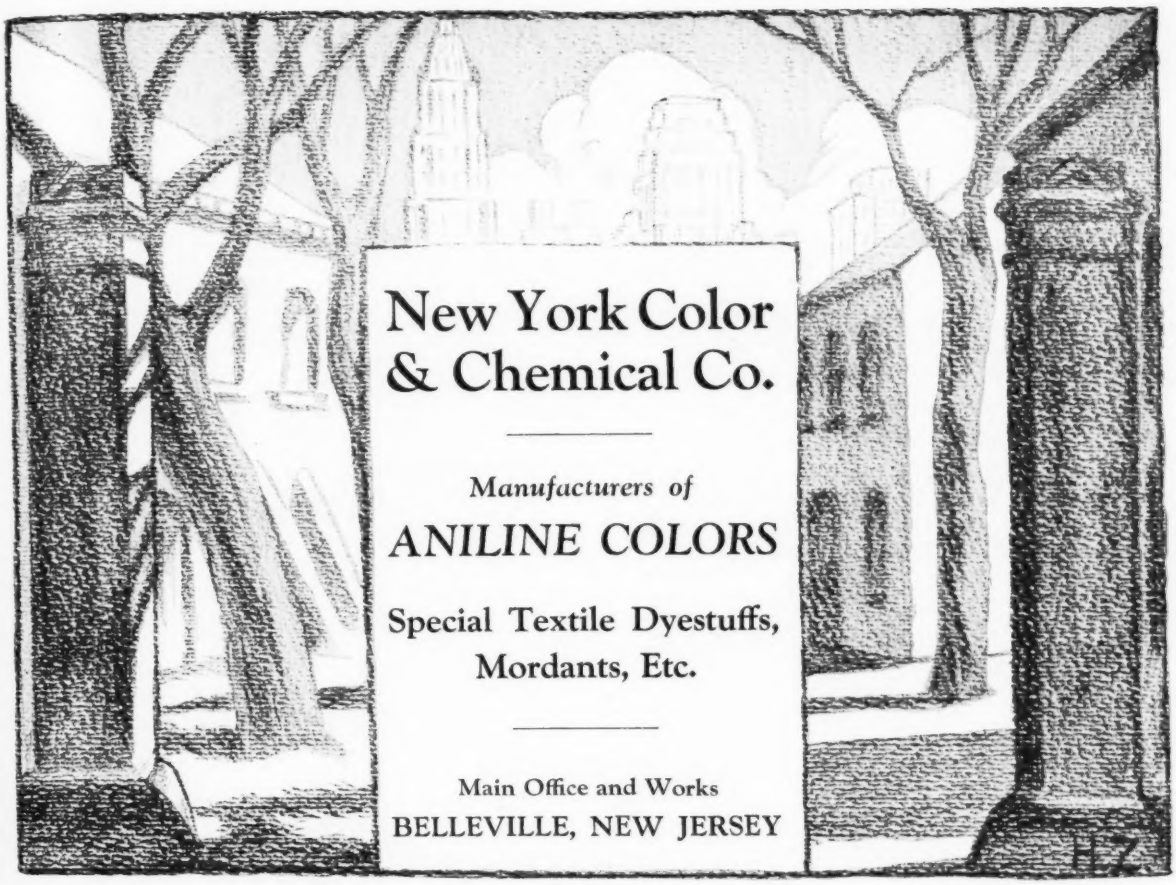

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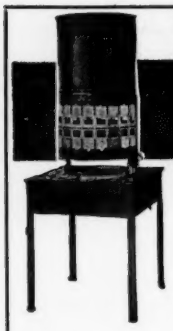

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VOLUME XV NEW YORK, NOVEMBER 15, 1926 No. 19

A Study of Some Derivatives of Ortho-Cresotinic Anilide

By PROF. FREDERICK S. BEATTIE AND CARL TOEPLER*

DURING a study of certain dyes prepared by coupling diazotized amines to "Naphthol AS" and "Naphthol BS," it occurred to the authors that it might be of interest to work out some closely related group along the same lines, for purposes of comparison. The present paper is the result of our studies.

The Naphthol AS (and related) series, as is well known, is merely that of a beta-naphthol derivative used as second component in azo couplings. The dyes produced by coupling a particular amine to beta-naphthol and its common derivatives are much the same, with some exceptions, save that the dyes from the naphthol itself are likely to be dull in shade as compared to those derived from a derivative of beta-naphthol of acid nature. Thus, a certain amine coupled to beta-naphthol, to Schaeffer, Crocein, R and G salts, or to beta-naphthol-trisulphonic acid, all fall into about the same group in color and resemblance of shade, but the shade at least is found to be brighter and livelier in the case of the sulphonated derivatives. Another reason for the preference given to the mentioned derivatives of beta-naphthol is that dyes derived from beta-naphthol as second component tend to be more insoluble than those from sulphonated beta-naphthol, even though the first component, the amine, is fairly heavily sulphonated. (It is dangerous, perhaps, to make too broad a statement, but the above are our conclusions after a study of many couplings undertaken for the purpose of testing this very point.)

Now, if instead of using a sulphonation product of beta-naphthol we choose a carboxylated derivative, we find that such a derivative used as a second component yields dyes which stand, perhaps, intermediate in brightness of shade and in general solubility in water between those from beta-naphthol and its sulphonic acids. Their shade usually resembles but is not very near in brilliance to the shade produced by a sulphonation derivative, and their solubility is likely to be rather low, nearing the low solubility of the dyes from beta-naphthol. About the only compound of this nature at all available is the so-called "hydroxy-naphthoic acid," with the hydroxyl and carboxyl groups in the 2-3 positions in the naphthalene ring. But, using this compound as second component, the improvement in shade over that from beta-naphthol would hardly justify its use, as it is naturally considerably more expensive than beta-naphthol. Further, the dyes from it are usually too soluble in water to be useful as pigments or developed colors, and too difficultly soluble (again we speak only in a general way, for there are notable exceptions) to be of much use as water-soluble dyes applied in a bath.

But those derivatives of 2-hydroxy-3-naphthoic acid in which the carboxyl group has been converted to an anilide group have been found to be of great value. The anilidation (if we may coin a needed word) of the acid group does not much alter the shade of a dye produced from it, or else, if it does, it brightens the shade (in some cases surprisingly). And simultaneously the solubility in water of the dye diminishes to that of a beta-naphthol dye, since by anilidation of the carboxyl group this group can no longer form salts with alkalies (at least, not in aqueous solution or suspension). The products are therefore of the pigment class, and may be so used in substance; or they may be produced in the fiber of a fabric by the ordinary process of padding and developing. It is such compounds so produced that form the dyes of the important "Naphthol AS" group.

Naphthol AS is the anilide and Naphthol AS-BS the meta-nitroanilide of 2-hydroxy-3-naphthoic acid. Their extended use and their great value are well known.

Since phenol and its carboxyl derivative, salicylic acid, ortho-cresol and its corresponding derivative, ortho-cresotinic acid, and beta-naphthol and its derived 2-hydroxy-3-naphthoic acid form a closely re-

*Part of the present article is from the thesis presented in 1922 by Mr. Toepler in part fulfillment of the requirements for the degree of bachelor of textile chemistry at the Lowell Textile School. It has since been carried on jointly.—F. S. B.

lated series of suitable and much used second components in dye synthesis in the azo group, we selected ortho-cresotinic acid as the starting point for our comparative study. The parallel between ortho-cresotinic acid and 2-hydroxy-3-naphthoic acid is not as close as might be desired, since with ortho-cresotinic acid coupling will take place normally, in the para position to the hydroxyl (the groups CH_3, OH and COOH lie in the 1-2-3 positions), while in the case of 2-hydroxy-3-naphthoic acid we have no true para or ortho relationship in position. Since ortho-cresotinic acid is available commercially in reasonably pure condition, we chose it as the starting point, though we should have selected para-cresotinic acid, with the groups CH_3, OH and COOH in the 1-4-3 positions, thus forcing coupling to take place ortho to the hydroxyl, for closer analogy with the hydroxy-naphthoic acid derivatives, had the para-acid been obtainable commercially or capable of being prepared in any reasonable quantity in the laboratory.

Naphthol AS is prepared, according to D. R. P. Nos. 264,527 and 293,897, by adding slowly one-third molecule of phosphorous tri-chloride to one molecule of 2-hydroxy-3-naphthoic acid and one molecule of aniline (other bases—for example, meta-nitro-aniline—are mentioned in the patent), dissolved in hot toluene. The mixture is then refluxed gently for some hours, as long as HCl gas escapes; the toluene is then driven off with steam after addition of water and some sodium carbonate, and the desired product isolated from the aqueous residue, after cooling, by filtration. If the reaction has not been complete because of too brief refluxing, or if any of the reacting substances were accidentally in excess, the steam distillation would remove any volatile amine with the toluene, the hydroxy-naphthoic acid would have gone into solution in the sodium carbonate, and the phosphorous tri-chloride would have decomposed with the water to form HCl and phosphorous acid, both of which would have been disposed of by the sodium carbonate. So that ordinarily the product desired would already be fairly pure, though recrystallization from various solvents is spoken of in the patents relating to this group of compounds.

We used the above method at first in attempting to prepare the anilide of ortho-cresotinic acid. Our results were discouraging, a rather poor yield of impure product being obtained. As the compound, so far as we could ascertain, has not yet been described, it seemed best to attempt some other method of synthesis, in the hope of finding a more satisfactory method, or at least of obtaining the material for some comparative tests, by a different method.

It was found impossible to form the anilide by heating together ortho-cresotinic acid and aniline in the oil bath, as the acid lost CO_2 and was converted to ortho-cresol before much reaction could take place between the acid group and the aniline.

It was considered that the reaction of ortho-cresotinyl chloride and aniline should give the anilide smoothly. But the chloride cannot be prepared by the action of phosphorous pentachloride or trichloride upon the acid, in any good yield or without the simultaneous formation of various complicated phosphorous esters, on account of the phosphorous chlorides reacting, not only with the carboxyl but also with the hydroxyl group, so that it was considered useless to test this method.

We prepared a little of the acid chloride, by wetting o-cresotinic acid, in fine powder, with thionyl chloride, refluxing on the water bath for an hour, and removing the excess of thionyl chloride by heating in vacuo. The cresotinyl chloride thus prepared was impure, some acid always escaping the action of the thionyl chloride. It reacted well with excess of aniline, and treatment of the product with dilute HCl removed aniline and aniline hydrochloride, and treatment of the residue with warm, dilute sodium carbonate solution removed cresotinic acid. The residue, finally crystallized from acetic acid, agreed in all its properties with the product obtained by the use of phosphorous trichloride reaction, but the yield was so small and the process so troublesome that we returned to the original method.

A careful study of the reaction as first carried out indicated that the principal trouble lay in the impurity of the phosphorous trichloride used. With a purer brand, the reaction was found to proceed smoothly. When equal moles of aniline and ortho-cresotinic acid, diluted with about five times the volume of dry toluene, were boiled up under reflux, in the oil bath, for a short time, then cooled to about 70 deg. and shaken frequently while one-third mole of phosphorous trichloride was dropped in, sufficient agitation was provided, beyond shaking, by the HCl gas evolved. After addition of the phosphorous trichloride, the mixture was refluxed for about five hours. We found that mechanical stirring under reflux, always troublesome, was not necessary.

When the reaction mixture had been sufficiently refluxed, the mixture, on cooling, was treated with about an equal volume of 10 per cent sodium carbonate solution and distilled with steam to remove toluene and traces of aniline. The hot aqueous residue, after cooling, was filtered, the solid product well washed and crystallized moist from 50 per cent acetic acid. Two recrystallizations gave a slightly gray but essentially pure product, with an average yield of 95 to 97 per cent of theory.

As the anilide does not appear to have been described either in the old or new Beilstein or in Stelzner's supplementary volumes, a portion of it was carefully purified by repeated crystallization from 50 per cent acetic acid and from 96 per cent alcohol, with the addition of animal charcoal, until its melting point remained constant, and was then analyzed. The re-

sults are given under the descriptive notes at the close of this article.

The same method of preparation was found to work well in the case of several other anilides of ortho-cresotinic acid, to be mentioned later.

The couplings made were carried out by the usual methods. One mole of the anilide was finely powdered, barely moistened with alcohol, a 10 per cent solution of one and one-twentieth mole of caustic soda added, the mixture well stirred for a minute or two, and then diluted with warm water to a convenient volume (usually 1 liter per gram-molecule). After short stirring, the anilide was completely dissolved. The moistening with alcohol made possible an instant wetting with the caustic soda solution, and the rapid stirring and speedy dilution minimized the tendency to hydrolysis, which we at first feared (though, as it later appeared, without much cause). The solution thus prepared was divided into suitable aliquot portions, an excess of saturated solution of sodium carbonate added to each portion to maintain an alkaline reaction, the portions chilled by addition of ice, and treated, with stirring, with the solutions or suspensions of the just previously diazotized amines. Coupling usually took place at once. After standing over night, the products were isolated in solid form, either by direct filtration, by acidification by hydrochloric or acetic acid, or, as in the case of the sulphonic acid derivatives, by salting out. Usually, where any product was isolated it was obtained in excellent yield. The products were recrystallized from a suitable solvent (after testing the solubilities in the chosen list of solvents) before analyses and determination of the melting point.

We have gone rather thoroughly into this first series of couplings, though we have omitted report of a considerable number of couplings with other amines available in this laboratory. In later work we shall probably select a smaller but representative list to report upon.

It will be seen, from the descriptive notes of the compounds prepared, that the influence of the second component, the anilide, is persistently strong. The color of the products is mostly yellowish, or orange or reddish-yellow, though the tendency toward deepening or darkening of shade by substitution in the first component is, of course, noted.

The dyeings on cotton, by padding with the alkaline anilide solution and development with the diazotized amines, were carried out at the same time with the preparation of the dyes in substance, and, of course, are the same in color with the solid products, though obviously weaker. The dyeings on cotton are distinctly not fast to washing. This likewise was to be expected, from consideration of the less bulky molecular mass of our products as compared with those from hydroxy-naphthoic anilide. Careful study of some of our products with an improvised ultra-microscope has given no ground for considering them as of colloidal nature. At least, if the products are of that order of magnitude they probably stand low in the colloidal range.

Descriptive Notes on the Products Obtained

(Note—The following abbreviations are employed below: V. s., very soluble; e. s., easily soluble; mod. s., moderately soluble; sp. s., sparingly soluble; d. s., difficultly soluble; v. d. s., very difficultly soluble.)

Ortho-cresotinic anilide: Colorless prismatic needles, d. s. boiling water, v. d. s. cold, but crystallizes well, v. s. hot glacial acetic acid, mod. s. cold. Mod. s. ethyl or methyl alcohol. M. P. 128°.

Calc. for $C_{14}H_{13}O_2N$, N = 6.17%.
Found, 6.12, 6.21%.

Ortho-cresotinic anilide as second component, coupled with the following amines:

Aniline: Brown yellow powder, m. p. 95°-96°. V. d. s. pet. ether, e. s. other solvents. Color of solution golden brown.

Calc. for $C_{20}H_{17}O_2N_3$, N = 12.69%.
Found, 12.58, 12.62%.

Ortho-toluidine: Olive-brown powder, m. p. 92°-94°. D. s. methyl alcohol, v. d. s. pet. ether, e. s. other solvents. Solution brownish-yellow in color.

Calc. for $C_{21}H_{19}O_2N_3$, N = 12.17%.
Found, 11.89, 12.01%.

Meta-toluidine: Bright gold-orange powder, m. p. over 250°. Insoluble in pet. ether, carbon bisulphide, carbon tetrachloride and benzene, mod. s. acetic acid, e. s. other solvents. Color of solution golden yellow.

Calc. for $C_{21}H_{19}O_2N_3$, N = 12.17%.
Found, 11.91, 11.98%.

Para-toluidine: Olive-brown powder, m. p. 128°-129°. V. d. s. pet. ether, v. s. carbon bisulphide, chloroform, benzene, mod. s. other solvents.

Calc. for $C_{21}H_{19}O_2N_3$, N = 12.17%.
Found, 12.02, 12.20%.

m-Xylidine: Failure. Coupling apparently took place, but only tar could be isolated.

p-Xylidine: Failure. Result same as with m-xylidine.

Mesidine: Dark brown powder, softens at 100°. Ins. pet. ether, e. s. other solvents.

Calc. for $C_{23}H_{23}O_2N_3$, N = 12.26%.
Found, 11.03, 11.16.%.

Pseudo-Cumidine: Ochre-yellow powder, m. p. 172°-173°. Ins. pet. ether, e. s. other solvents. Solution colored brown yellow.

Calc. for $C_{23}H_{23}O_2N_3$, N = 12.26%.
Found, 11.11, 11.30%.

a-Naphthylamine: Garnet-red powder, m. p. 96°-97°, softening at 92. D. s. pet. ether, e. s. other solvents. Solution colored deep orange-red.

Calc. for $C_{24}H_{19}O_2N_3$, N = 11.02%.
Found, 10.89, 10.96%.

b-Naphthylamine: Dark red-brown powder, m. p. 134°-136°, softening at 129. V. d. s. pet. ether, mod. s. all other solvents. Solution colored deep orange red.

Calc. for $C_{24}H_{19}O_2N_3$, N = 11.02%.
Found, 11.11, 11.15%.

o-Chloraniline: Dull ochre powder, m. p. 148°, softening at 138. V. d. s. cold pet. ether, mod. s. carbon bisulphide, e. s. all other solvents. Solution colored red-brown.

Calc. for $C_{20}H_{16}O_2N_3Cl$, N = 11.49%.
Found, 11.09, 11.22%.

m-Chloraniline: Dull light ochre powder, m. p. 148°-149°, softening at 130. Sp. s. methyl and ethyl alcohols, acetic acid, mod. s. butyl alcohol, carbon bisulphide, chloroform, benzene, v. d. s. pet. ether, ethyl ether, carbon tetrachloride. Solution colored golden brown.

Calc. for $C_{20}H_{16}O_2N_3Cl$, N = 11.49%.
Found, 11.37, 11.39%.

p-Chloraniline: Ochre powder, m. p. 139°, softening at 121°. V. d. s. pet. ether, sp. s. carbon bisulphide, carbon tetrachloride, chloroform, mod. s. all other solvents. Solution brown yellow.

Calc. for $C_{20}H_{16}O_2N_3Cl$, N = 11.49%.
Found, 11.40, 11.51%.

o-Bromaniline: Ochre yellow powder, m. p. 146°-147°. Ins. pet. ether, v. d. s. acetic acid, d. s. benzene, chloroform, carbon tetrachloride, n-butyl alcohol, mod. s. other solvents. Solution colored brown yellow.

Calc. for $C_{20}H_{16}O_2N_3$ Br, N = 10.25.
Found, 10.12, 10.26%.

m-Bromaniline: Dull olive-brown powder, m. p. 139°-140°, softening at 130°. V. d. s. pet. ether, d. s. ethyl alcohol, n-butyl alcohol, mod. s. methyl alcohol, carbon bisulphide, carbon tetrachloride, acetic acid, e. s. ether, chloroform, benzene. Solution, red brown.

Calc. for $C_{20}H_{16}O_2N_3$ Br, N = 10.25.
Found, 10.06, 10.14%.

p-Bromaniline: Bright olive-brown powder, m. p. 151°-152°, softening at 140°. D. s. pet ether, acetic acid, chloroform, ethyl alcohol, mod. s. n-butyl alcohol, e. s. all other solvents. Solution, olive brown.

Calc. for $C_{20}H_{16}O_2N_3$ Br, N = 10.25.
Found, 10.31, 10.22%.

o-Anisidine: Ochre-brown powder, 168°-169°. Ins. pet. ether, sp. s. benzene, mod. s. methyl alcohol, e. s. carbon bisulphide, acetic acid, d. s. ethyl alcohol, n-butyl alcohol, ethyl ether, chloroform, carbon tetrachloride. Solution, orange red.

Calc. for $C_{21}H_{19}O_3N_3$, N = 11.63%.
Found, 11.54, 11.59%.

p-Anisidine: Ochre-brown powder, m. p. over 250°. Ins. pet. ether, mod. s. acetic acid, d. s. ether, carbon tetrachloride, benzene, e. s. all other solvents. Solution, brown-red.

Calc. for $C_{21}H_{19}O_3N_3$, N = 11.63%.
Found, 11.61, 11.70%.

p-Phenetidine: Dark brown powder, m. p. 155°-156°. V. d. s. pet. ether, sp. s. ethyl alcohol, mod. s. n-butyl alcohol, d. s. ether, carbon bisulphide, e. s. all other solvents. Solution, brown-red.

Calc. for $C_{23}H_{21}O_3N_3$, N = 11.20%.
Found, 11.05, 11.09%.

o-Nitraniline: Red-brown powder, m. p. 151°-152°, softening at 125°. V. d. s. pet. ether, mod. s. all other solvents. Solution, brown-red.

Calc. for $C_{20}H_{16}O_4N_4$, N = 14.89%.
Found, 14.70, 14.84%.

m-Nitraniline: Deep buff powder, m. p. 174°-176°, softening at 150°. Ins. pet. ether, d. s. all other solvents. Solution, orange. Strongly triboelectric.

Calc. for $C_{20}H_{16}O_4N_4$, N = 14.89%.
Found, 14.62, 14.59%.

p-Nitraniline: Dark red-brown powder, m. p. over 250°. Ins. pet. ether, v. d. s. toluene, chloroform, carbon bisulphide, d. s. acetic acid, mod. s. ether, e. s. all other solvents. Solution, deep scarlet.

Calc. for $C_{20}H_{16}O_4N_4$, N = 14.89%.
Found, 14.74, 14.86%.

2-Amino-4-nitrotoluene: Ochre-yellow powder, m. p. 152°. Ins. pet. ether, toluene, mod. s. ethyl ether, chloroform, d. s. all other solvents. Solution, yellow.

Calc. for $C_{21}H_{18}O_4N_4$, N = 14.36%.
Found, 14.21, 14.26%.

2-Amino-5-nitrotoluene: Dark, red-brown, softening below 100°. Ins. pet. ether, d. s. toluene, carbon tetrachloride, mod. s. carbon bisulphide, chloroform, e. s. all other solvents. Solution, orange-red.

Calc. for $C_{21}H_{18}O_4N_4$, N = 14.36%.
Found, 14.27, 14.40%.

2-Amino-6-nitrotoluene: Red-brown, softening with decomposition above 200°. Ins. pet. ether, toluene, carbon bisulphide, d. s. acetic acid, carbon tetrachloride, mod. s. chloroform, ethyl ether, ethyl and methyl alcohols, n-butyl alcohol. Solution, orange.

Calc. for $C_{21}H_{18}O_4N_4$, N = 14.36%.
Found, 14.36, 14.31%.

4-Amino-2-nitrotoluene: Dull brown, m. p. 141°-142°. Ins. pet. ether, mod. s. toluene, acetic acid, chlo-

roform, ethyl ether, d. s. ethyl, methyl or n-butyl alcohols, v. d. s. carbon bisulphide. Solution, dull yellow.

Calc. for $C_{21}H_{18}O_4N_4$, N = 14.36%.
Found, 14.21, 14.30%.

4-Amino-3-nitrotoluene: Brown, m. p. 166°-167°. Ins. pet. ether, mod. s. ethyl, methyl, or n-butyl alcohols, e. s. all other solvents. Solution, orange.

Calc. for $C_{21}H_{18}O_4N_4$, N = 14.36%.
Found, 14.19, 14.24%.

4-Amino-nitro-1-3-xylene: Red brown, softening at 100°. Ins. pet. ether, d. s. acetic acid, ethyl alcohol, mod. s. all other solvents. Solution, bright orange.

Calc. for $C_{22}H_{20}O_4N_4$, N = 13.86%.
Found, 13.62, 13.74%.

p-Amino-acetanilide: Ochre brown, m. p. 185°-186°, softening at 171°. Ins. pet. ether, v. d. s. benzene, ether, carbon bisulphide, mod. s. acetic acid, e. s. all other solvents. Solution, brown-red.

Calc. for $C_{22}H_{20}O_3N_4$, N = 14.43%.
Found, 14.29, 14.41%.

4-Amino-3-nitrophenetole: Orange brown, m. p. 199°-200°. Ins. pet. ether, v. d. s. carbon tetrachloride, mod. s. toluene, acetic acid, carbon bisulphide, e. s. all other solvents. Solution, orange.

Calc. for $C_{22}H_{20}O_5N_4$, N = 13.33%.
Found, 13.19, 13.28%.

2-4-Dichloraniline: Ochre yellow, m. p. 119°-120°. V. d. s. pet. ether, mod. s. toluene, acetic acid, ethyl, methyl, or n-butyl alcohols, e. s. ethyl ether, carbon bisulphide, chloroform. Solution, yellow.

Calc. for $C_{20}H_{15}O_2N_3Cl_2$, N = 10.50%.
Found, 10.37, 10.44%.

2-5-Dichloraniline: Ochre yellow, m. p. 193°-196°. V. d. s. pet. ether, d. s. all other solvents. Solution, yellow.

Calc. for $C_{20}H_{15}O_2N_3Cl_2$, N = 10.50%.
Found, 10.43, 10.58%.

(Part II will appear in an early issue)

On the Fastness to Light of the Naphthol Combinations

Experiments with Boiling Aftertreatment to Determine Most Favorable Conditions for Maximum Fastness

By DR. LUDWIG LOECHNER

(Translated from Textil-Berichte by Carl Toepler.)

VARIOUS complaints by the trade of the varying light fastness of the Naphthol AS dyeings, especially when working with the combination of Naphthol AS-SW and Fast Red KB Base, made it necessary to investigate this important question.

Especially remarkable was the combination of Naphthol AS-SW and Fast Red KB Base dyed on the jigger and aftertreated boiling hot. Comparative light exposures made by a client with a dyeing of Naphthol AS + BS—Fast Scarlet RC Base were in favor of the latter, while a dyeing of Naphthol AS-SW—Fast Red KB Base and that of Naphthol AS—Fast Red GL Base were equal.

It is well known that a boiling hot aftertreatment has a favorable action on the light fastness of the naphthol combinations; it is only necessary to discover the most favorable conditions for reaching the maximum fastness. It was thought that free naphthol as well as free base residues might exert an influence on the light fastness.

For the experiments, the three most important combinations, Naphthol AS—Fast Red GL Base, Naphthol AS-SW—Fast Red KB Base, and Naphthol AS-RL—Fast Red RL Base, were drawn upon. The material used was bleached calico, so that every influence exerted on the color lake by the impurities of the fiber was eliminated.

The dyeings were made in the following strengths:

Naphthol AS (8 gm. per liter); Fast Red GL Base (1.5 gm. per liter).

Naphthol AS-SW (3 gm. per liter); Fast Red KB Base (1.8 gm. per liter).

Naphthol AS-RL (6 gm. per liter); Fast Red RL Base (1.5 gm. per liter).

I.—Series of Experiments.

Seven normal dyeings were treated as follows:

1. Rinsed cold.
2. Rinsed 5 minutes at 50 deg. Cent.
3. Rinsed 5 minutes at 100 deg. Cent.

4-7 are rinsed cold, then rinsed at 40 deg. Cent. and then treated as follows:

4. Soaped 5 minutes at 50 deg. Cent.
5. Soaped 30 minutes at 50 deg. Cent.
6. Soaped 5 minutes at 100 deg. Cent.
7. Soaped 30 minutes at 100 deg. Cent.

II.—Series of Experiments.

A normal dyeing is treated as follows:

After developing and rinsing in cold water, the dyeing is boiled for one-half hour in a solution of 2 c.c. NaOH 34 deg. Be. and 2 c.c. Turkey Red oil, and then

1. Rinsed cold.
2. Rinsed cold, acidified with 2 c.c. HCl 20 deg. Be. per liter, and rinsed until free from acid.
3. Rinsed cold, and soaped.

III.—Series of Experiments.

A normal dyeing is treated as follows:

After rinsing the dyeings are padded with a solution of the naphthol of the following strength: Naphthol AS, 1 gm. per liter; Naphthol AS-RL, 1 gm. per liter; Naphthol AS-SW, one-half gm. per liter.

Treat for 15 minutes, then acidify with 2 c.c. HCl 20 deg. Be. per liter. Then followed by:

1. Rinsed cold.
2. Rinsed cold and soaped.

The original dyeings after a cold rinse are soaped boiling hot for one-half hour, and then treated with naphthol solution as under (1) and (2), and finally

3. Rinsed cold.
4. Rinsed cold and soaped.

IV.—Series of Experiments.

A normal dyeing is treated as follows:

1. Treat for 15 minutes with diazo solution of Fast Red GL Base (.6 gm. per liter), Fast Red RL Base (.6 gm. per liter), and Fast Red KB Base (.7 gm. per liter), and soap without rinsing again.

2. A normal dyeing is rinsed, soaped boiling hot for one-half hour, and then aftertreated with diazo solution as under (1), followed by a short rinsing.

The tests were exposed from May 25, 1925, until August 1, 1925, to the rays of a strong sun, one part without glass protection, while another part was protected by glass. Four sets of exposures were made, producing results agreeing in all respects. The dyeings made without glass protection showed somewhat greater fading.

The results of the four series of experiments are given in the following table. The fastness to light is designated by (1) to (5), whereby (5) is given as the greatest fastness.

Series I.

Naphthol AS—Fast Red GL Base.

1. 2-3
2. 2-3
3. 3-4
4. 4
5. 4
6. 4-5
7. 4-5

Naphthol AS-SW—Fast Red KB Base.

1. 2
2. 2
3. 2
4. 2-3
5. 3
6. 3-4
7. 4

Naphthol AS-RL—Fast Red RL Base.

1. 4-5
2. 4-5
3. 5
4. 5
5. 5
6. 5
7. 5

Series II.

Naphthol AS—Fast Red GL Base

1. 4
2. 4
3. 4

Naphthol AS-SW—Fast Red KB Base.

1. 4
2. 4
3. 4

Naphthol AS-RL—Fast Red RL Base

1. 5
2. 5
3. 5

Series III.

Naphthol AS—Fast Red GL Base

1. 2
2. 4
3. 4
4. 4

Naphthol AS-SW—Fast Red KB Base.

1. 2
2. 4
3. 4
4. 4

Naphthol AS-RL—Fast Red RL Base

1. 4-5
2. 5
3. 5
4. 5

Series IV.

Naphthol AS—Fast Red GL Base

1. 4
2. 4

Naphthol AS-SW—Fast Red KB Base.

1. 4
2. 4

(*Continued on page 772*)

The General Action of Acids on Wool

Part I

A Review of the Literature Upon the Action of the Acids in General on Wool in Particular—The Adsorption Theory of Combination and the Change in This Theory Due to the Hydrogen Ion Concentration Factor—Removal of Acids from Wool by Rinsing

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WHILE the action of all reagents upon wool is of interest, the specific action of those in common use in textile processes is of most importance to those engaged in this industry. The most commonly used reagents in this field are the acids and alkalies. Practically every fiber of wool comes into contact with one and usually both of these reagents at least once, and generally quite often, during the many and various processes of manufacture.

General

It is a well known and commonly admitted fact, which will be discussed much more in detail in a later paper of this series, that both wool and silk, as well as all other textile fibers, are "injured" or "damaged" more or less in almost every manufacturing operation, either dry or wet, but particularly in the latter.

In the dry processes, exclusive of the actual drying operation itself, the injury is of course largely physical or mechanical, such as that caused by the wear and strain due to friction and tension in the carding, combing, spinning, winding, weaving, stentering, pressing, etc. In many of these operations, as well as in other processes, such as drying, the extent of the actual damage is more or less dependent upon the amount of moisture (condition or regain) present in the fiber during the operation, which constituent greatly alters the properties of the fiber and therefore its liability to injury. In the drying operation in particular, the extent to which the fiber is injured in process depends almost altogether upon the temperature used, the extent to which the drying is carried, and the character and amount of foreign materials (chemicals) present in the fiber. In drying, these foreign materials become concentrated and may do considerable irrepairable damage to the fiber.

In any wet operation on wool, such as scouring, dyeing, wet finishing processes, etc., in which an acid or alkali takes any part, not only the desired effect but also the damage to the fiber is very frequently, but not always, almost entirely dependent upon the hydrogen ion concentration and temperature of the aqueous or other liquid phase. For instance, Scott, AMERICAN DYESTUFF REPORTER *14*, 862-5 (1925), has shown that in dyeing in an acid bath, the amount of dyestuff combining with the fiber is entirely proportional to the hydrogen ion concentration of the dye bath. This will be considered more in detail in a later paper on dyeing.

The extent of the fiber damage is also very materially affected in many cases by the previous history of the particular fiber under consideration, especially where the stock has at any time previously received an unusually severe treatment of the opposite character, i. e., acid or alkaline treatment.

The hydrogen ion concentration of the solution, which is the only real measure of its true activity, either as regards to the desired effect of the reagent or to its injurious effects upon the fiber, is very largely dependent upon the variety (for example, bicarbonate, carbonate, or hydroxide) of alkali or acid present, but is also affected and more or less controlled by the other factors, such as time, temperature, and the character and quantity of other materials (salts, decomposition products, protective agents, etc.) which may be present, the nature of the solvent, although this is usually aqueous, etc. For this reason, it is very easy to understand just why complete knowledge of the hydrogen ion concentration factor, and of the action of the various chemicals and reagents on the proteins, particularly on wool and silk, is of such importance and wide interest in the textile field.

The Action of Acids on Wool

A very great deal has been written both for and against the chemical combination of acids with wool but, as pointed out by Loeb, all of the early investigators overlooked the hydrogen ion concentration factor in supporting the results of their investigations, which in most cases almost entirely obviates their results for many purposes.

All of this was fully discussed in the previous papers on "Protein Compounds"* and "The Chemical Reactions of Keratin and Its Congeners,"** most of which discus-

*American Dyestuff Reporter, August 23 and September 6 and 20, 1926.
**American Dyestuff Reporter, October 4, 1926.

sion is more or less directly applicable to the reactions of wool, in a general way. It is not necessary again to go into a detailed discussion of this subject, and before reviewing the literature on the action of acids on wool, it will be sufficient to call attention to the fact that according to the latest and most reliable work upon the proteins, wool included, the amount of acid entering into combination with wool from the solution is almost entirely controlled by the hydrogen ion concentration of the remaining solution. Under identical conditions of hydrogen ion concentration, it is very probable that most acids will have almost, if not quite, the same destructive action on wool.

A great deal of work has been done upon the action of acids on wool, the amount retained by the fiber under various conditions, its form of combination with the fiber, the amount removed by rinsing, etc. These subjects have been widely discussed in the textile and other literature, but in most of this work and discussion the hydrogen ion concentration factor was entirely overlooked. In the following review of the literature on the subject of acids on wool, the hydrogen ion factor has been kept to the front where it belongs, as the most important factor in the reaction. In much of this literature it has been impossible to completely separate the work upon wool and silk, but no effort has been made to include silk in the discussion, except where it has some bearing upon the subject in connection with wool, or for purposes of comparison.

The Early Work

Probably the first quantitative work upon the combination of acids with wool (and silk) was that of Chevreul "Dictionnaire Technologique," Vol. XXI, page 365 (about 1833). Chevreul found that when wool or silk is steeped in a dilute solution of acid of known strength, the solution becomes weaker, and states that the acid can be removed from the fiber by continued washing.

Bolley, in his "Kritische und Experimentelle Beitrage zur Theorie der Farberei" (Zurich, 1859), confirms Chevreul's results as regards wool and silk, and states that tartar (potassium bitartrate) is decomposed by wool, which combines with the acid, leaving the neutral potassium tartrate in solution.

Mills and Takamine, *J. Chem. Soc.*, March, 1883, page 144, arrived at the conclusion that when wool was treated with solutions containing equal molecular proportions of hydrochloric acid or sodium hydroxide, it combined with the reagents in the proportions of 2HCl:3NaOH, while silk combined in the proportion 3HCl:1ONaOH. They give Table XX showing the relative proportions of sulphuric and hydrochloric acids taken up by wool from various mixtures of these acids.

Bowman, "Wool Fiber" (1885) page 196, says "The action of acids upon wool is very similar to their action on all horny structures, but very different from their action on cotton." He quotes Weisner (reference not given) as stating that horsehair and mohair which before acid treatment broke under a load of 480 grains, after treatment with not over 4 per cent of acid at temperatures below 65 deg. Cent. (150 deg. Fahr.), carried as much as 568 grains. When the strength of the acid solution was raised to 7 per cent, the fiber was weakened.

TABLE XX

Relative Amounts of Sulphuric and Hydrochloric Acids Taken Up by Wool from Their Mixed Solution

Parts of	Wool		Silk	
H_2SO_4 HCl	H_2SO_4	HCl	H_2SO_4	HCl
1 : 1	5.0	32.5	6.6	0.87
1 : 2	11.3	25.5	5.0	2.5
1 : 4	16.6	18.4	4.0	3.5
	Proportional Absorption			
1 : 4	100 to 179.6		100 to 175.0	

Bowman, upon repeating these experiments on English wool, was unable to find any strengthening effect of the dilute acid treatment, but states that he found no weakening of the fiber even when 10 per cent of sulphuric acid was used. He found the temperature to be a very important factor and that the fiber was weakened by prolonged treatment at temperatures under 65 deg. Cent. (150 deg. Fahr.) with solutions not exceeding 2.5 per cent of acid.

Prof. Knecht, *J. Soc. Dyers and Colourists 4*, 114-5 (1888), believed that "when wool is boiled with sulphuric acid, one part of the acid is absorbed temporarily by the wool, another part remains in the solution as free sulphuric acid, and a third portion remains in the wool as combined sulphuric acid. If then the wool is boiled repeatedly in water, the sulphuric acid, both free and combined, is removed, and you ultimately account for all the sulphuric acid in solution, chiefly free, but partly combined."

Watson Smith, *J. Soc. Dyers and Colourists 5*, 12-9 (1889), in discussing the action of acids on wool, states that while dilute hydrochloric or sulphuric acids, whether hot or cold, have little action on wool, they open out the scales or serations on the fiber and hence promote felting. The feel of the wool also becomes harsher but he believes that this is not due to fiber damage.

Vignon, *Bull. Soc. Chim. 3*, 405-10 (1890); and *Comptes Rendus* (1890), pages 909-10, determined calorimetrically the heat evolved by wool, silk and cotton in reacting with acids and alkalies. Table XXI gives his results for wool. In each case 10 to 12 grams (on a dry basis) of unspun wool and in woolen threads, at normal regain, were treated in 500 c.c. of 1.0 *N* reagent. In every case a distinct evolution of heat took place which ceased after five minutes. He calculated the results for 100 grams of dry wool, and also for the molecular formula $C_{88}H_{149}N_{27}O_{27}S_3$ (mol. wt. = 2,111). It should be noted that heat is also evolved on wetting wool with water, as will be mentioned in a later paper.

TABLE XXI

Heat Evolved (in Calories) by Treating Wool with Different Reagents at 11 to 12 deg. Cent. (52 to 54 deg. Fahr.)

	Woolen Thread, Unbleached	
Reagent	For 100 Grams	For $C_{88}H_{149}N_{27}O_{27}S_3$
Sulphuric acid	0.99	20.90
Hydrochloric acid	0.95	20.05
Sodium hydroxide ...	1.15	24.30
Potassium hydroxide.	1.16	24.50

	Unspun and Unbleached Wool	
Reagent	For 100 Grams	For $C_{88}H_{149}N_{27}O_{27}S_3$
Sulphuric acid	1.05	22.20
Hydrochloric acid	1.00	21.10
Sodium hydroxide ...	1.10	23.20
Potassium hydroxide.	1.37	28.90

Table XXII gives the same results for raw and degummed silk. Vignon degummed eight skeins of silk, out of sixteen skeins, with a loss of 22.94 per cent. In each case 500 c.c. of the 1.0 *N* reagent solution was used. It will be noticed that the total calories evolved by the degummed silk is 6.00, while the raw silk evolved 6.65 calories. Therefore, sericin apparently evolves about 1.47 times more heat than fibroin under the conditions of the experiment.

TABLE XXII

Calories Evolved on Treating Silk with Various Reagents at About 12 deg. Cent. (54 deg. Fahr.)

	——Raw Silk——	
	For 100 Grams	For $C_{141}H_{232}N_{48}O_{56}$
Distilled water	0.10	3.50
Sulphuric acid	0.95	33.10
Hydrochloric acid ...	0.95	33.10
Nitric acid	0.90	31.35
Sodium hydroxide ...	1.55	53.95
Potassium hydroxide..	1.35	47.00
Ammonium hydroxide	0.65	22.65
Potassium chloride ..	0.20	6.95

	——Degummed Silk——	
	For 100 Grams	For $C_{141}H_{232}N_{48}O_{56}$
Distilled water	0.15	5.20
Sulphuric acid	0.90	31.35
Hydrochloric acid ...	0.90	31.35
Nitric acid	0.85	29.60
Sodium hydroxide ...	1.30	45.25
Potassium hydroxide.	1.30	45.25
Ammonium hydroxide	0.50	17.40
Potassium chloride...	0.10	3.50

His results on cotton are given for comparison in Table XXIII. In each case unbleached cotton thread and unbleached cotton wool were used. Nine to thirteen grams were immersed in 500 c.c. of the 1.0 *N* reagent solution. The cotton is permeated by the liquid more slowly than wool, but on agitation, the total evolution of heat took place in 7 to 8 minutes.

TABLE XXIII

Calories Evolved on Treating Cotton with Various Reagents at 11 to 12 deg. Cent.

	Cotton Thread, Unbleached	
	For 100 Grams	For $C_6H_{10}O_5$
Sulphuric acid	0.38	0.60
Hydrochloric acid	0.40	0.65
Sodium hydroxide	0.65	1.05
Potassium hydroxide ..	0.80	1.30

	Cotton Wool, Unbleached	
	For 100 Grams	For $C_6H_{10}O_5$
Sulphuric acid	0.36	0.58
Hydrochloric acid	0.40	0.65
Sodium hydroxide	1.35	2.20
Potassium hydroxide ..	1.40	2.27

Walker and Appleyard, *Proc. Chem. Soc.* (1896) No. 168, page 147, studied the dyeing of silk by picric acid, which is undoubtedly closely related to this action on wool. They found that an equilibrium between the liquid and solid (fiber) phases is attained which is independent of the distribution of the materials. With other than aqueous solvents, the rate and amount of picric acid removed from solution seem to be connected with the dissociative power of the solvent. This indicates the effect of the hydrogen factor. Picric acid is not removed by silk from its solution in benzene or carbon tetrachloride. It is removed to some extent from ether and acetone, and more so from alcohol. On the basis of their experiments upon the extent of the absorption of the various acids by silk, they divide them into two classes: The aromatic acids where the absorption is great, and the non-aromatic acids where the absorption is relatively small. In each class there is a rough parallelism between the strength of the acids and the amount absorbed. The addition of calcium benzoate to a solution of benzoic acid greatly diminishes the strength of the acid and the absorption is thereby much diminished. Here again the hydrogen ion factor is apparent.

The Reducing Power of Wool

While the patent of Bethmann is along a somewhat different line from the foregoing, as regards the effect of acids upon wool, in order to treat the subject in a chronological order it will be considered at this time. B. found that on treating wool with acid, the reducing action of the fiber in various processes, such as in printing or dye-

ing Aniline Black, is very much lessened. He obtained British Patent No. 21,236 on such a process in 1900. In this patent he proposes to treat the wool with organic or inorganic acids, either in the form of diluted liquids or as a gas, or under a pressure of about 20 pounds per square inch, so that sufficient of the acid is taken up to "neutralize" the fiber. This may be done by boiling the wool for about an hour in an aqueous bath containing, say, 5 per cent of sulphuric or hydrochloric acid, on the weight of the goods. The pressure, about 20 pounds, may be applied while boiling. Such treatment is necessary in order to insure complete neutralization of the fiber.

He also mentions that the same result may be obtained by impregnating the fiber with an acid solution of about the same strength as above, and drying; or by treatment with acid vapors. In a later article, *Z. angew. Chem. 21*, 1817 (1906), B. mentions the use of 6 or 8 per cent of sulphuric acid, on the weight of the fiber, for an hour at the boil. He states that this acid-treated wool lacks the reducing action of the normal alkaline wool fiber, and that for this reason it is unnecessary to chlorinate or oxidize the wool before impregnating it with an Aniline Black mixture.

It is possible that the reducing action of the fiber mentioned by B. is due to the presence of a more or less soluble alkali-wool compound, and to the wool gelatin mentioned in "The Chemical Reactions of Keratin and Its Congerers,"* as well as to the enolic constitution of the wool molecule in the normally alkaline condition. Even though the solution of acid proposed in the above process is rather dilute, the boiling under 20 pounds pressure is rather severe, as is also the drying in of the acid on the fiber.

While the isoelectric point of wool (pH 4.8) is somewhat on the acid side of the theoretically neutral point (pH 7), the hydrogen ion concentration of the acid in contact with the fiber would very probably at some stage of the treatment be sufficient to bring about the enol-keto transformation of protein structure referred to in "Protein Compounds—I,"** leaving the wool molecule in the keto form. Possibly this keto form of molecular structure has less reducing power than the enolic form probably present in the alkaline protein. However, even if the wool is only brought to a hydrogen ion concentration nearly approaching its isoelectric point, we would naturally expect it to have much less chemical activity than when in a more alkaline condition, and therefore less reducing power.

Perold, *Inaug. Disseration, Halle-Wittenberg*, 1904, found that acids and amines combine chemically with wool by an "addition" process, and that there appears to be no appreciable difference between the capacity of wool to take up dyestuffs and colorless substances. He is not decided as to whether the bases combine with the carboxyl group or form "addition" compounds.

Georgievic's Work and Theories

Inasmuch as Von Georgievics has been one of the leaders in advocating the adsorption theory of dyeing, as well as other protein reactions, his work on the "adsorption" theory of combination of the acids with wool is of particular interest. G. appears to base many of his dyeing arguments and theories upon this work, in view of which Speakman's papers, which follow, are of particular interest in that they disprove G.'s theories by his own figures, merely by an application of the hydrogen ion concentration factor.

Von Georgievics and Pollak, *Monatsh. Chem. 32*, 655-75 (1911), believe that the *absorption* of acids by wool is an *adsorption* process. They found that as the strength of the acid solution is increased, the relative amount taken up by the wool decreases. In every case, with the acids studied, they believe that above a certain concentration (about 0.5 gram of acid per 250 c.c. of solution) the distribution of the acid between the fiber and solution follows the general formula:

$$\frac{\sqrt[x]{c_s}}{c_f} = K,$$

where c_s and c_f represent the quantity of acid in grams in the solution and fiber respectively, and x and K are constants which vary with the different acids. For hydrochloric acid, x is 5 and K is 0.293; while for acetic acid x is 1.75, and K is 0.545. They state that this type of formula is characteristic of all adsorption phenomena, and that therefore the taking up of acid from their solutions by wool must be classed as adsorption.

They found, however, from a comparison of the adsorption results with equimolecular solutions of the different acids, that in most cases the stronger acids are absorbed more than the weaker. They arranged the acids according to the amount absorbed, in the following order of decreasing adsorption: Nitric, hydrochloric, oxalic, sulphuric, adipic, succinic, formic and acetic; but they say that the order varies somewhat according to the conditions of the experiment, such as the strength of the solution. For example, in very dilute solutions, sulphuric acid is adsorbed more strongly than oxalic. In general, they state that mineral acids are absorbed to a greater extent than the fatty acids, and claim that their results agree with those of Walker and Appleyard. They found no relation between the degree of dissociation of the acid and its adsorption by the fiber. The adsorption is little

(*Continued on page 764*)

*American Dyestuff Reporter 15, 634 (1926).
**American Dyestuff Reporter 15, 536 (1926)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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ANNUAL MEETING OF SOUTHERN SECTION

[NOTE.—*A general report of the annual meeting of the Southern Section of the American Association of Textile Chemists and Colorists, held at the Cleveland Hotel, Spartanburg, S. C., October* 16, *appeared in the Proceedings in the November* 1 *issue. The three papers presented at that meeting were published in the same issue. Below is a more detailed report received later regarding the business transacted at the Spartanburg meeting.*]

Following the presentation of papers by John A. Law of Spartanburg, by J. M. Hatch of the Belmont Processing Company, Belmont, N. C., and by J. D. Dean, superintendent of finishing, Pacific Mills, Lyman, S. C., the annual reports were submitted by the local treasurer and secretary. These reports appear below.

Charles H. Stone, chairman of the Arrangements Committee explained, regarding the Annual Meeting of the Association, that there was a committee in the North in charge of arranging the technical program and that the Southern Section Committee was intrusted with the details of the entertainment program. Mr. Stone outlined two trips that have been planned for the members attending the Annual Meeting. On the first trip, on Thursday, December 2, textile plants in Greenville and vicinity will be visited; the second trip on Friday will include several plants in the section extending from Greensboro, N. C., to Spartanburg, S. C.

A. R. Thompson, in speaking of the smoker to be held during the Annual Meeting, said it had been suggested that a display of Southern textile products could be conveniently set up in the hall in which the smoker was held. Mr. Thompson was instructed to develop this idea.

As this was the annual meeting of the Section, a Nominating Committee was appointed. After nominations were made and ballots counted, the following officers were elected for the coming year: Chairman, Leonard S. Little, general manager, Pacific Mills, Lyman, S. C.; vice-chairman, Prof. C. S. Doggett, Clemson College, S. C.; secretary, Dyer Moss, Newport Chemical Works, Greenville, S. C.; treasurer, M. T. Johnson, Judson Mills, Greenville, S. C.

Sectional Committee—R. W. Arrington, Greenville, S. C.; L. E. Green, Charlotte, N. C.; W. D. Shields, Durham, N. C.; W. H. Willard, Charlotte, N. C.; E. H. Bowers, Greenville, S. C.

The chairman was instructed to appoint a committee to confer with the National Council during the Annual Meeting concerning the question of qualifications of applicants and the possibility of appointing a Southern Committee, the work of this committee being the examination of applications originating in the South and the reporting of its findings to the Council of the Association.

Upon motion it was passed that the National Council permit this Section to change its name to the "Piedmont Section." This request was made because the south-

western part of the Southern Section now has a petition before the Council to form a new section.

Respectfully submitted,

H. W. ORMAND, *Secretary.*

Secretary's Report

Southern Section

Since the last annual report four meetings have been held by the Southern Section. The first of these meetings was held October 10, 1925, at the Poinsett Hotel, Greenville, S. C. R. W. Arrington, superintendent of the Union Bleachery, Greenville, S. C., read a paper on "The Dyeing and Finishing of Cotton Fabrics Containing Rayon." Dr. Chas. H. Herty, president of the Synthetic Organic Chemical Manufacturers' Association, addressed the Section on "The American Dyestuff Industry Relating to the Government's Policy and Problems Confronting the Industry."

As this was the annual meeting officers were elected as follows: Chairman, Leonard S. Little, general manager, Pacific Mills, Lyman, S. C.; vice-chairman, Chas. H. Stone, General Dyestuff Corporation, Charlotte, N. C.; treasurer, M. T. Johnson, Judson Mills, Greenville, S. C.; secretary, H. W. Ormand, Union Bleachery, Greenville, S. C.

The second meeting was held January 23, 1926, at the Alamance Hotel, Burlington, N. C. Dr. E. C. Brooks, president of N. C. State College, Raleigh, N. C., addressed the meeting on "The Importance of the Technical Man to the Textile Industry." A paper was read by M. T. Johnson, Judson Mills, Greenville, S. C., on "Dyeing of Vat Colors on Rayon."

The third meeting was held April 17, 1926, at the Hotel Patten, Chattanooga, Tenn. A paper was read by J. D. Murray, manager of the Franklin Process Company, Chattanooga, Tenn., on "The Franklin Process System of Dyeing."

L. L. Bamberger, superintendent Georgia Branch of the United States Finishing Company, Cedartown, Ga., spoke on "The Dyeing and Finishing of Cotton Piece Goods." Mr. Bamberger illustrated his address with a motion picture in which the principal operations were shown.

The fourth, or summer meeting, was held July 17 at Blowing Rock, N. C. James H. Purdy, general manager of the Southern Worsted Company, Greenville, S. C., read an interesting paper on "Making, Dyeing and Finishing Worsteds in the South."

C. W. Gaddy, superintendent of the Knitting Department, Wiscassett Mills, Albemarle, N. C., spoke on "The Making and Dyeing of Full Fashioned Hosiery."

W. L. Van Riper, of the Du Pont Company, addressed the meeting on "The Increasing Demand for Fast Dyed Fabrics."

At present there are 126 members in the Southern Section distributed as follows:

North Carolina	37
South Carolina	23
Georgia	21
Tennessee	26
Other Southern States	19

Respectfully submitted,

H. W. ORMAND, *Secretary.*

Annual Report of the Treasurer

Southern Section

RECEIPTS

Received on account of Greenville meeting	$114.00
Received from retiring treasurer	5.49
Received from parent association	69.00
Received on account of Burlington meeting	165.00
Received on account of Chattanooga meeting	19.50
Received on account of Blowing Rock meeting	139.00
Total receipts	$511.99

DISBURSEMENTS

Paid out on account of Greenville meeting	$152.74
Paid out on account of Burlington meeting	146.68
Paid out on account of Chattanooga meeting	25.19
Paid out on account of Blowing Rock meeting	147.60
Total Disbursements	$472.21
Balance	$39.78

M. T. JOHNSON, *Treasurer.*

OCTOBER MEETING OF THE NEW YORK SECTION

The October meeting of the New York Section of the American Association of Textile Chemists and Colorists convened Friday, October 29, at eight twenty-five o'clock in the Machinery Club, 50 Church Street, New York City, Chairman Herbert Grandage presiding.

Chairman Grandage—The Program Committee has tried hard to arrange a program for you to-night that would interest everyone.

Dr. Wuth, as you probably know, has just returned from Europe, and I am going to ask him to speak to us to-night. Dr. Wuth needs no introduction to the members of this Section, I am sure.

Just before Dr. Wuth speaks, I want to announce the two committees that have been appointed for our Sec-

tional work, and to say once more that the Committees themselves feel that they don't want to do all the work. They will appreciate any help that any members who are not active members of the Committee can give them.

Our Membership Committee is composed of Mr. Knowland, our Secretary, as Chairman, C. A. Pullar, and Walter Lotte.

Our Program Committee is composed of Dr. Pickrell as Chairman, Mr. Hayes, our Vice-Chairman, and Mr. Schaumann.

They will all appreciate, I am sure, any help that members who are not actively connected with those Committees can give them.

Dr. Wuth has asked that we only give him ten minutes to speak, or rather, that he only be permitted to speak for ten minutes. He hasn't assured me, either, that after he has finished talking he will be willing to answer questions on the subject that he is to talk about. Not knowing what his subject is going to be, I can't extend the invitation to you to ask him questions.

Dr. Wuth! (Applause.)

Dr. Berthold Wuth—Mr. Chairman and Gentlemen: Not until yesterday afternoon did I see the Secretary's circular letter announcing the meeting to-day, and I was astonished to see that I was booked to speak of some new developments on dyeing, or something similar. During my sojourn abroad, I saw no new developments which would be worthy of your attention. I am sorry that I didn't have time to prepare a rounded out paper to submit to you this evening, and all that I can give you is just a report on some recent experimental work.

It is very difficult to choose a topic from color chemistry to speak about, especially before the members of this Association, as textile chemists and colorists nowadays are well acquainted with all modern theories, practical developments and the newest literature.

It is rather audacious to pick a topic from such a vast and undiscovered field as is the theory of dyeing and the action of light on dyed material. If I do so this evening, what I give you will be nothing more than an experimental fragment.

Some months ago, a communication came to us that cotton goods dyed with a certain Anthraquinoid Orange vat dyestuff had been tendered on exposure to light. We were very much inclined to take this as an individual case and put it down to faulty manipulation such as might be caused by improper or insufficient neutralization after an acid treatment. But very soon after that the same report came from other parts and even from other countries, including an Anthraquinoid Vat Yellow.

That, of course, was food for pretty deep thought as it could not possibly be faulty manipulation that would simultaneously bring this phenomenon to light just within a very short period. We investigated and found that the statement was correct: that cotton dyed with these two dyestuffs is tendered on exposure to light quite considerably.

These two dyestuffs in question (if other dyestuffs have shown the same result, I don't know) have been on the market now for about twelve or fifteen years, and we had never heard of any tendering action on the cotton fiber. We naturally looked into the manufacture and found that nothing had been altered, and though raw materials and intermediates had been bought from various sources in the meantime the vital analyses were always the same. It was explained, to a certain extent, that before 1914 vat dyestuffs were almost exclusively used on yarn and if yarn woven into a material would be tendered on exposure to light, this tendering would not be noticed.

These two dyestuffs are closely related to sulphur dyestuffs, inasmuch as sulphur or sodium sulphite is used in their manufacture, and it is generally known that sulphur dyed goods, especially Sulphur Black dyed goods, tender in storage, presumably through the oxidation of sulphur to acid.

It was quite natural to think that the same effect was to be found in these vat dyeings, especially as the exposed dyeings showed a distinct acid reaction to Congo.

We then took thirteen anthraquinoid vat dyestuffs, of the Cibanone, the Indanthrene, the Algol, and the Helendone group, which have no constitutional sulphur, and we found that on exposure to light the cotton was tendered to exactly the same extent as it was with the two dyestuffs originally complained of. All of these dyeings were acid to Congo.

The next step was to extend the experiments to sulphur dyed goods and we chose yellow and orange sulphur colors, dyed the fiber, exposed to light, and found the same tendering in the sulphur dyed goods as we had in the vat dyed goods, but no acid reaction.

These two groups of colors were dyed in alkaline vat containing sulphur. The idea still persisted that sulphur present in some form or other might be the cause and we furthered our experiment on the line of ordinary direct colors, such as Direct Fast Yellow, Direct Orange TR, and various others, dyed with common salt, and we found that the tendering was the same with direct colors as we found it with vat colors and sulphur colors.

We gathered from that that the tendering was not due to the constitution of the colors or to the manipulation, and the only thing that we could then think of was some action of light on the dyed fiber.

I have a few of the percentages that we worked out. Figures are generally dry but they sometimes tend to illuminate the case. We first tested the yarn, ordinary

yarn, on Schopper's Tensimmeter you might call it, and the experiments were made after dyeing and then after exposure.

The undyed yarn showed 470 units and lost on being exposed to light 9 per cent of its strength. The vat yellows and sulphur yellows and direct yellows varied as to their shade; the redder they get, the less they are tendered. They ran from a tendering of 68 per cent to 45 per cent. So you see there is quite a distinct tendering there.

When you go to the reddish orange, the tendering is less and in red dyeings we find that a very yellowish red is tendered and if you have a bluish red the tendering is much less. We had two reds. One showed 42 per cent tendering, whereas a 7BL showed only 18 per cent tendering.

Blue dyeings, vat, sulphur and direct colors, showed, vat 16, and the direct color and Sulphur Blue only 5 per cent—that is practically nothing. That shows it is only the yellow and orange dyestuffs which have a tendency to weaken the fiber on exposure.

For an explanation we had to go back to the fundamental theory of the action of light. We know that a white substance reflects all rays of light and that a black substance absorbs them all. Any color that we see consists partly of reflected and partly of absorbed rays. If we see a body that we call yellow, it means that all the yellow rays of the white light are reflected and all the others, with the exception of yellow, are absorbed. So in a yellow dyeing there are really no yellow rays on the fiber.

Light is an energy, and as energy is never lost, the absorbed rays must contain energy, and that is either shown by transformation of the absorbed rays into heat or in the chemical energy or in rays of different wave lengths.

The transformation of absorbed rays to heat is supposed to be that which takes place in the case of fast to light dyestuffs, inasmuch as the action can go on indefinitely without any further action on the colored body.

The chemical energy must have some other body to let its energy work on. It is supposed that the body worked on is the colored body, the dyestuff, but that is not true in all cases. It need not necessarily work on the colored body; it can also work on the carrier of that colored body.

There is a third transformation in rays of different wave lengths. That is the well-known phenomenon of fluorescence, that doesn't come into consideration here.

The heat caused by the transformation of these rays into heat would never be sufficient to tender cotton fiber. So there remains the chemical energy.

The transformation of rays into chemical energy is what is known as actinism, and from other sciences—photograph, polarization, and other things—we know that the different colored rays have varying actinism, and blue violet and ultraviolet are the highest actinic waves.

In the case of yellow we have a high percentage of blue violet and ultraviolet rays on the fiber, which produce a very high chemical energy. If we have a blue dyeing where we see there is no tendering at all, the blue violet and ultraviolet rays, as far as we know, are reflected, not absorbed. Hence, the fiber has only absorbed rays, which are not actinic.

That is as far as our experiment leads us up to the present time. As I said, it is very fragmentary, but it is going to be carried on, especially by exposing these dyed fabrics through various colored glasses, such as yellow and blue glass filters, to see what data we can gain from that. Then, naturally, if we find that chemical energy formed in the transformation of light rays acts on the fiber, the object will be to look for some other body for which this chemical energy has perhaps more affinity than for the fiber.

We have a little pointer there, inasmuch as some yellow sulphur dyestuffs have great tendency to deteriorate the strength of the fiber, whereas when they are aftertreated the percentage drops down from about 50 to 20. That would mean that the chemical energy was taking some other course than just attacking the fiber.

When we get further in this matter, I shall collect the data, and if you gentlemen are interested in it I shall be pleased at some other time to come here and lay before you what we have found.

I thank you for your kind attention. (Applause.)

Discussion

Chairman Grandage—Dr. Wuth says he is quite willing to answer any questions that you may care to ask him.

Dr. H. F. Herrmann—Dr. Wuth, the information that light has this action in the tendering of cotton is rather amazing and I would like to know just how long an exposure is required to produce this phenomenon, that is, how long an exposure to light is necessary to cause a 50 per cent loss in strength.

Dr. Wuth—The experiments were carried out with a dyed piece of Indigo, and the exposures, naturally, would be of varying length. That is why the Indigo was used. As soon as we see a distinct fading of Indigo, we consider the exposure finished. In certain times of the year, it will take longer, and it will vary at certain times of the year, and on sunny or cloudy days. We always had an indicator, a medium dyed Indigo, and exposed that until it was faded to what our standard fading was.

Dr. Herrmann—So that the exposure was directly limited to the resistance to light of a standard color like Indigo? It wasn't a prolonged exposure?

Dr. Wuth—No.

Dr. Herrmann—And you used sunlight continuously direct, without any glass?

Dr. Wuth—Under a glass frame.

Dr. E. L. Pickrell—Did you use any blanks of the undyed cloth, to determine how much of this tendering was due to the chemical reagents and how much to the color?

Dr. Wuth—I didn't quite catch that question.

Dr. Pickrell—I say, did you use any blanks, that is, the undyed cloth, in your test in order to determine how much of the tendering was due to your chemical reagents in your dye bath and how much to the color?

Dr. Wuth—Yes, sir. We tested the dyed raw material, and as I said, we found 9 per cent weakening there. That, of course, is due to the natural yellow coloring of the fiber. If that material had been blue, or if ultramarine had been put in there, probably the tendering wouldn't have been so marked; it wouldn't have reached 9 per cent.

As to the other dyeings from the dye bath, they were always tested after the dye bath and then tested after exposure.

Dr. Pickrell—Did you run a blank at each time, or just one blank at the beginning?

Dr. Wuth—Just one blank at the beginning, and always used the same material.

Dr. Pickrell—Did you run a blank for your sulphur dyes, another one for your vat dyes, and another one for your direct dyes?

Dr. Wuth—No, always the same material.

Dr. Pickrell—You had one constant figure of 9 per cent. Wouldn't you have had a variable if you had run a separate blank with each one of your different dye baths?

Dr. Wuth—I don't know.

Dr. Pickrell—You have different chemical reagents.

Dr. Wuth—But you couldn't run the blank through the dye bath. I don't quite see your point.

Dr. Pickrell—You could have your fabric, and put it in a separate vat, like you run a sulphur color, and run your reagents as if you were making a dyeing.

Dr. Wuth—That was not done.

Dr. Pickrell—Then you would determine how much of this was due to your chemical reagents and how much to your color.

Dr. Wuth—Yes, but that was not done.

Mr. Hayes—Did you try, Doctor, the effect of one of your very bad yellows and one of your good blues, as a green?

Dr. Wuth—No.

Mr. Banting—I would like to ask if that is true on silks and woolens.

Dr. Wuth—The experiments so far have only been carried out on cotton. Naturally, they will be extended to silk and wool as we get that far.

Mr. Herrmann—Were the dyed fabrics finished or were they unfinished?

Dr. Wuth—Simply dyed.

Mr. Hirsch—You spoke of the sulphur dyed yellow being aftertreated and then being somewhat increased in strength. Was that without changing the shade, because generally aftertreatment of Sulphur Yellow dulls it very much, and that might account for the increased strength?

Dr. Wuth—Yes, it dulls it and reddens it. That would account for an increase in strength, but the increase in strength was more marked than the difference in shade would really call for.

Mr. Hirsch—Was that the usual aftertreatment, with copper sulphate?

Dr. Wuth—Yes. The dyestuff used in that case was Pyrogene Yellow G.

Chairman Grandage—Are there any more questions?

We are surely grateful to Dr. Wuth for that very original thought on tendering. I have a very vivid recollection of a certain batch of yarn that was dyed not so very many years ago, and I would have appreciated that thought on the cause for tendering a whole lot more at that time than I do now. If I could have strung that about four years ago, I would have gotten out of a big hole.

For our second paper to-night, M. J. Seavy, of the Palo Company, will describe and demonstrate for us the Microprojectograph. Mr. Pollack was to have helped Mr. Seavy with his paper afterwards in discussing the application side of it, or rather, the more technical side of the use of this particular instrument. I haven't been able to locate Mr. Pollack as yet. If he is in the audience, I wish he would make himself known.

Mr. Seavy! (Applause.)

A New Instrument for Micro-Analysis of Textiles

By M. J. Seavy

I do not come to you as a specialist in the textile field, and I want to tell you at the beginning that I am not going to make a speech. In fact, I will probably find myself very much in the position of the old colored man down South who was ill. He had been ailing for several weeks. His wife finally induced him to go to the doctor and when he returned, his wife inquired the result of the diagnosis. He simply remarked, "It can't be done!"

She said, "What do you mean, it can't be done?"

"Well," he said, "the doctor put me on a chicken diet for several weeks and made me promise I would stay in every night. It can't be done!" (Laughter.)

The original idea of design was suggested to us by the trend toward a greater use of instruments for both qualitative and quantitative analysis in the laboratory and plant. There is a large and growing demand for instru-

ments which offer a quicker and sured method of analysis than those formerly used. That was the main reason that prompted us to design this instrument.

As the first part of the name of the instrument indicates—"Micro"—it has a microscope attached to it so that microscopic analyses or examinations can be made separately. "Projecto"—indicates that projection of the microscopic image is accomplished. The last part of the name—"graph"—comes from the fact that you can make microphotographs with the instrument.

I have the instrument in the rear of the room, and if you will bear with me for just a minute, I will set it up there and demonstrate it further.

In designing the instrument, we have given extensive consideration to the cost. There has been a certain amount of complaint among the chemists and other scientific men of the apparently extremely high cost of instruments. We have located and used a microscope on this instrument which is inexpensive, yet equipped with sufficient optical lenses to give a clear, definite and flat field. The microscope used is that which I hold in my hand.

The achromatic objective on the microscope is a divisible one producing two sizes of fields so that when you wish to examine a sample for defects, spots or trouble, you can get a larger field by using the single objective. The largest field obtainable is approximately five mm. For higher powers and smaller fields, you screw on the first objective. The magnification obtained is read off direct on the draw tube. You cannot see the figures from where you are, but there is a calibration on the microscope drawtube of from 100 × up to 200 × which is used when both objectives are employed. On the other side of the drawtube the magnification calibrations run from 30 × up to 75 ×, indicating the magnifications obtained when you use the single objective.

The instrument has a reflecting mirror which can be drawn aside when it is desired to use it for examination of fabrics or dyes by placing it directly upon the material to be examined. The microscope stage is equipped with clips so that it takes regular microscopic slides or, if desired, you can put your fabric or fibers under the clip which will hold them in position for examination. The microscope is so constructed that it can be handled rather roughly without any damage to the objectives or the instrument. The stand is made of a one-piece aluminum alloy casting which is hollow. It isn't very heavy; in fact it weighs only eleven ounces.

I have here a microscope attached to the lamp house on a support which makes up the complete Microprojectograph. You will note there is a diaphragm on the microscope to keep the excess light emitted around the objective from falling on the screen or paper. In the metal lamp housing there is mounted a 250-watt projection bulb with concentrated filament. That filament is lined up with a series of condensing lenses in this tubular housing between the lamp house and the microscope. The condensing lenses concentrate the light to a point on the stage and thus perfectly illuminate the object under examination.

I have prepared a number of slides of various kinds of fibers and fabrics which I will now project on the daylight screen. [Slide] This slide is a mixture of Celanese and cotton. I neglected to state that in addition to having a rough focusing arrangement, the microscope also has a fine focusing attachment which is operated by a spiral thread on the objective. You do not, as a rule, have to use the fine adjustment except when you have to make photomicrographs or when considerable detail is necessary to bring out the object you are viewing.

I don't want to have you feel that this instrument is put out as the last word in photomicrographic equipment. It isn't. Instead we have many types of regular photomicrographic cameras particularly adapted to photographing things of this sort. I have here one of the new Busch Photomicrographic cameras which has recently been designed, that clamps on to the top of the microscope and is firmly held in position, being a solid part of the complete instrument. You observe the field of view, from the observation eyepiece on the side. There is a dividing prism in this metal tube. The rays of light from the image come up through the body tube giving you two images: one in the observation eyepiece and one on the ground glass or photographic plate. The observation eyepiece is focused on the cross-hairs and then while observing through the observation eyepiece, the object to be ex-

Apparatus in Vertical Position for Drawing or Photographing

amined is brought in focus with the fine adjustment of the microscope. As it is brought in focus through the observation eyepiece, it is simultaneously sharply focused on the photographic plate. You can make your observations first on the ground glass, slip it out, put in a plate holder and make your photomicrograph in the regular way, giving it time or instantaneous exposure, as required.

However, an equipment of this sort runs into more money than the Palo Microprojectograph, but the latter is a quicker and easier means of photographing, providing you have a dark room available. We have designed, but it is not ready for the market yet, a housing which cuts out all of the excess light so that we will be able to use plates and make photomicrographs with the Palo Microprojectograph and thus do away with the necessity of a dark room.

[Slide] For more detail in projecting fibers and fabrics so that they can be examined in larger magnifications, higher powers, you can remove the eyepiece which, by the way, is an orthoscopic eyepiece and not a regular huyghenian. We use that because the eyepiece and the objective are so close together and it thus corrects for that distance and, furthermore, the orthoscopic eyepiece gives a larger field of view and produces more definition.

With the eyepiece removed, you can project distances up to twenty to twenty-five feet so that the fibers which you see on this slide will be approximately five times the magnification shown at the distance which we are projecting here.

[Slide] That shows you how two fibers can be definitely compared at the same time. One of those samples is rayon and cotton and the other one is cotton. This (indicating) is the cotton and this (indicating) is the rayon and cotton.

[Slide] This is rayon and cotton and silk and cotton. Of course, there is a big difference there. Some of that difference is caused by this one being a little darker. It is a redder sample, or rather a brownish tinted sample. But the difference in the weave is easily noticeable.

I have one other slide I would like to put on, to show the effect of crepe. [Slide] That is Georgette, showing the fibers after the cloth is creped.

Separate fibers may be examined. [Slide] Those two fibers are rayon on this side, and silk on the other. They don't show up very well for distance projection because they do not absorb much light. That is, they are almost entirely transparent. Those who are up close to the screen can see that the rayon is absorbing a great deal more light than the real silk fibers.

I have one cotton sample. [Slide] There is a fiber of wool in with that cotton. The screen is so close to the instrument here that it can't be seen clearly. It ought to be about twice that distance to show up the wool, but if you will look closely you will see the one wool fiber here.

[Slide] That is cotton again and mohair, the mohair running up through the center.

[Slide] That piece being used there brings out a larger magnification, but at a distance you can't see it because the orthoscopic eyepiece has three lenses and

For Horizontal Projection

absorbs so much light that you lose the intensity as you go away from the instrument. Of course, if it is used up closer you can get it and you see there the mohair fiber.

[Slide] The instrument complete or the microscope used separately serves exceptionally well as a thread counter, as you will note from this slide. You see here that I am projecting a section one-eighth of an inch square instead of a circular field. Of course, with this it is easy to count the threads because of the magnification which, in this case, is approximately 85. Higher or lower magnifications may be obtained, depending upon the weave of samples with which you have to deal.

I don't know just how close the mesh runs in various fabrics, but if you take a piece of wire gauze which runs up to 300 mesh you can easily count the mesh with this equipment in the way here illustrated.

The other slides that I have are simply in a way duplicates of some of the others, except that they are a little different materials. All the fibers are very similar. Take mohair, for instance, and wool. They both look very definite and look strong, as compared with cotton, but in the image that is thrown there the structure of the wool comes out and shows that scale effect on top, as compared with the mohair.

Before I conclude, I want to show you how the photographs are made.

The instrument which is turned up now in a horizontal position can be swung around vertically and projected down on the table or on a piece of paper for drawing or for observation. In fact, close-up observation of high magnifications is much better than a projection of this sort, unless you throw the image 20 or 25 feet so that you get the added value of the increase in magnification. However, in photographing, you swing the instrument in vertical position and put in a piece of cardboard, white cardboard, that is the thickness of your plate, a regular photographic plate, focus the instrument on top of the cardboard; you remove the cardboard (in a dark room) and replace it with the photographic plate. Then you can, through the snap switch, make a snapshot, or if it is a colored object and the image is dull, you can give it time as is required.

You will find that in photographing you will probably have some difficulty in certain colors, such as purples. The true color—what you men would consider the true color—is undoubtedly not projected here, because of the loss of light in traveling from the instrument to your screen, and of the absorption of the light passing through the sample. But the purple is not sensitive to photographic plates and you lose considerable detail.

This trouble is done away with by using filters. For instance, in purple, the detail can be brought out by a yellow. In fact, the yellow glass filters that are used by the photographer are just about right for purples and greens.

There are a series of filters that have been brought out. In fact, Eastman Kodak Company have published an article on photomicrography and filters, and there are eight or ten which have been used very satisfactorily.

In some cases you will find that ordinary plates for photographic or permanent records of defects or trouble on material are not suitable, but for most work, orthochromatic plates which are made now by the Eastman Kodak Company in this country are the best. They are sensitive to all colors, except dark red, and panchromatic plates are sensitive to the dark red.

So if those two types of plates are used, you can photograph practically any of the colors that you have or want to make records of.

If any one wishes to ask questions in regard to the application of the instrument, I shall be glad to answer them. I won't venture any technical information because as I said in the beginning I am not a technical man in the textile field.

Chairman Grandage—I have one question I want to ask: How much does this cost?

Mr. Seavy—As I explained, one of our aims in designing this instrument was to keep the price as low as possible. The microscope alone costs from $20 to $22, depending upon what is supplied with it, a case or a pouch, or a pouch and a case. The instrument complete as it is there, including the microscope, is $48.

Dr. Killheffer—That is without the camera?

Mr. Seavy—That is without the camera attachment which we have in course of development. But this equipment which I have here can be used for photographing as it is, if you use it in a dark room.

Chairman Grandage—Are there any other questions?

If not, are there any matters of new business that any of our members want to bring up at this time?

W. E. Hadley—Mr. Chairman, one of our very prominent members died within the past few days, Mr. William D. Livermore. It might be well for us to express our sorrow at this sad news.

Chairman Grandage—Mr. Livermore died just a few days ago. He served well, and served ever since the Association was formed. As a mark of tribute to him, I will ask that you rise for a few seconds.

. . . The members arose and stood in silent tribute to the memory of Mr. Livermore. . . .

Chairman Grangage—If there are no other matters of new business at this time, I will call for a motion to adjourn.

. . . The meeting adjourned at nine twenty-five o'clock.

Applicants for Membership

Active Membership

MacKinnon, Edward A., assistant sales manager, E. I. du Pont de Nemours & Co., Boston, Mass. Sponsors: R. E. Lunt and H. R. Davies.

Murphy, T. F., acting superintendent Dye Technical Division, National Aniline & Chemical Company, Buffalo, N. Y. Sponsors: W. R. Moorhouse and Edward Weber.

Noble, Frank M., dyer, Eagle & Phenix Mills, Columbus, Ga. Sponsors: Tom Taylor and M. Mackenzie.

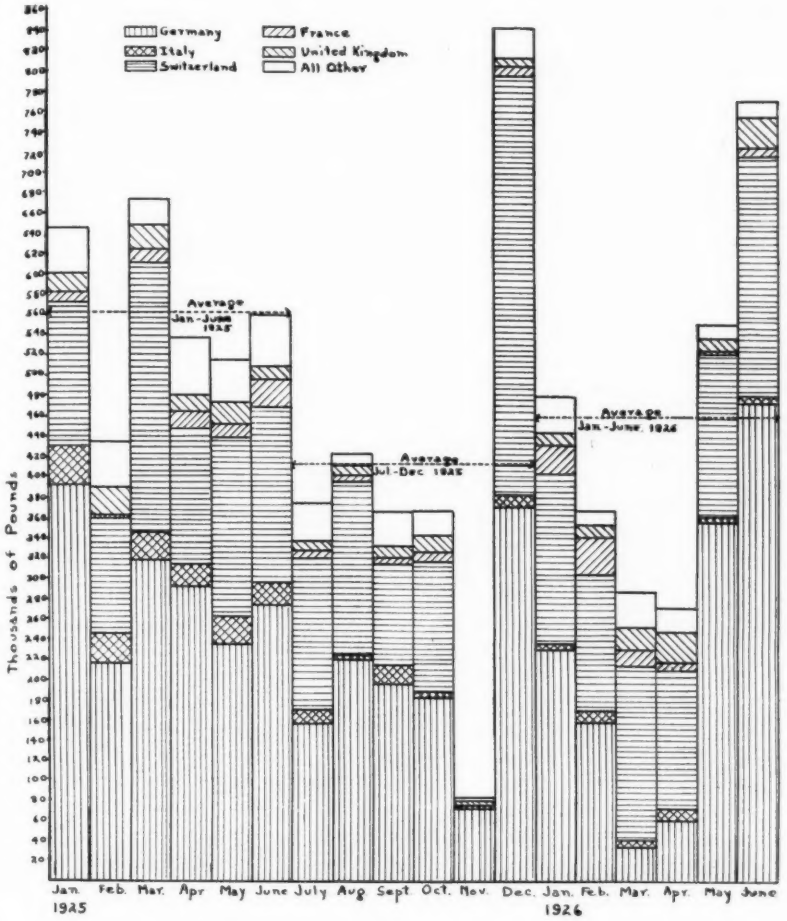
O'Reilly, Raymond J., colorist, National Aniline & Chemical Company, Boston, Mass. Sponsors: D. W. Symmes and A. K. Gyzander.

Junior Membership

Griffin, William B., dyer and student, National Aniline & Chemical Company, Philadelphia, Pa. Sponsors: Percival Theel and E. C. Bertolet.

Changes of Address

Brainerd, Carroll L., 24 Orchard Street, Passaic, N. J.
Brooks, Clyde K., 37 Marsh Street, Concord, N. C.
Robbins, Wm. K., 686 Hall Street, Manchester, N. H.



United States Dyestuff Trade

For 1925 and First Half of 1926

Imports of Coal Tar Dyes by Countries

January, 1925, to June, 1926

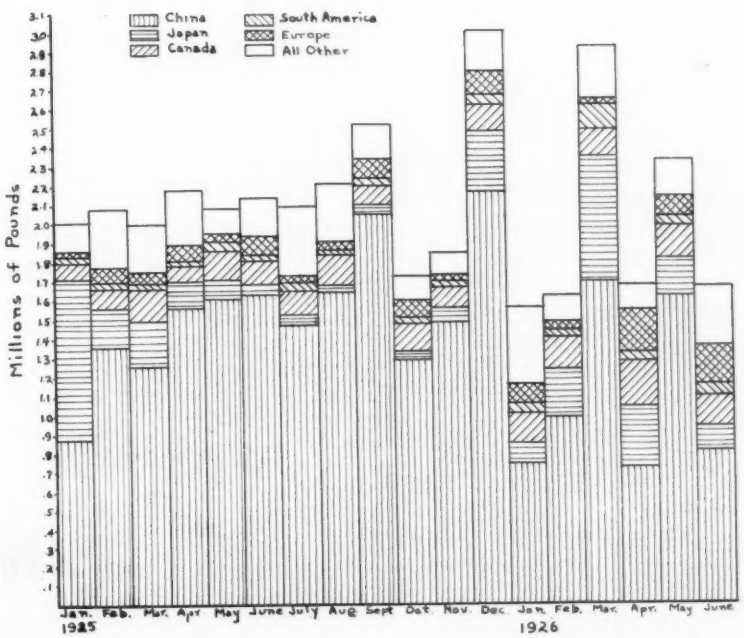
←

Exports of Coal Tar Dyes by Countries

January, 1925, to June, 1926

→

Charts made from monthly statistics of the Department of Commerce by Synthetic Organic Chemical Manufacturers' Association.



THE GENERAL ACTION OF ACIDS ON WOOL

(*Continued on page 754*)

affected by temperature and is usually slightly less at higher temperatures.

They also found that the adsorption of acids from solutions containing equal quantities of hydrochloric and sulphuric acids follows the above absorption formula but the total amount of acid absorbed is diminished. That is, the total amount of acid taken up by the wool from the mixed solution, containing 1 part each of sulphuric and hydrochloric acids (2 parts of mixed acids), is less than the mean of the absorption from separate solutions containing 2 parts of hydrochloric acid and 2 parts of sulphuric acid, respectively. In very dilute solutions the adsorption of sulphuric acid is slightly increased by the presence of hydrochloric acid, but in stronger solutions the action is decidedly reversed. The adsorption of hydrochloric acid from its solutions is decreased by the presence of sulphuric acid.

In a later paper, *Monatsh. Chem. 32*, 1075-87 (1911), Georgievics decides that the taking up of acids from solution by wool must be regarded partly as adsorption and partly as solution. In very dilute solutions, only solution takes place, while in stronger solutions both solution and adsorption takes place, but the former is hidden by the latter effect.

Georgievics believes that picric acid acts in an abnormal manner, as compared with the other acids. With very dilute solutions the acid is taken up according to the absorption law. On increasing the concentration of the picric acid, instead of the amount adsorbed decreasing, as in the usual adsorption effect, there is, up to a certain point, a rapid relative increase in the amount taken up. After that, the usual falling off due to absorption becomes evident. G. attributes the intermediate stage between solution and adsorption to chemical action. He admits that chemical reactions between the fiber and dyestuff may occur, but only in a subordinate degree.

Walker and Appleyard, *loc. cit.*, state that the aromatic acids are more strongly absorbed by wool than other acids. Dietl, *Kolloid Z. 14*, 319-21 (1914), experimented with salicylic and benzoic acids, as compared with phosphoric acid, on the basis of Georgievics' work with Boedecker's distribution formula, and believes that the value of the exponent X, which G. believes varies with the strength of the acid, may be taken as a measure of the adsorption. D.'s results show that phosphoric, benzoic and salicylic acids are strongly adsorbed by wool, that the values for X are smaller than in the case of stronger mineral acids, and agree with G's rule. He also states that acetone and sucrose, both non-electrolytes, which should be only slightly adsorbed, give abnormally low values for X (1.47 and 1.1, respectively), indicating that in these cases the absorption is mainly due to solid solution. The total sorption is low in the case of acetone and sucrose, as would be expected according to the chemical theory of compound formation.

Georgievics and Dietl, *Z. physik. Chem. 87*, 669-91 (1914), state that acids are taken up by wool according to the concentration of the solution, the influence of the concentration on the velocity of absorption varying for different acids in the same way as the quantity X, being greatest in the case of the mineral acids, where X has a large value, and least in the case of the monobasic fatty acids. Other data are given which are claimed to support G.'s theory of sorption as a combination of diffusion (solution) and adsorption, the former dominating where X is low, the latter when it is high. In the same group of acids the coefficients connecting sorption with concentration follow the same order as those connecting diffusion with concentration, this arrangement being particularly marked in the case of the fatty acids.

The temperature coefficient for the sorption velocity of acetic and of hydrochloric acids is about 1.5, which G. and D. claim again indicates that the process is one in which solution rather than chemical action prevails, although the coefficient is distinctly higher than those usually found for rates of diffusion. They found that on diluting an acid solution which is in equilibrium with wool, the new equilibrium point is attained almost instantly with acetic, oxalic, hydrochloric, and sulphuric acids. They believe that the velocity of adsorption (or sorption) varies from case to case, that in some instances equilibrium is only attained after weeks of contact, and that it is not a very rapid process, as is frequently stated.

On account of the close connection of Speakman's paper, *J. Soc. Dyers and Colourists 40*, 408-11 (1924),

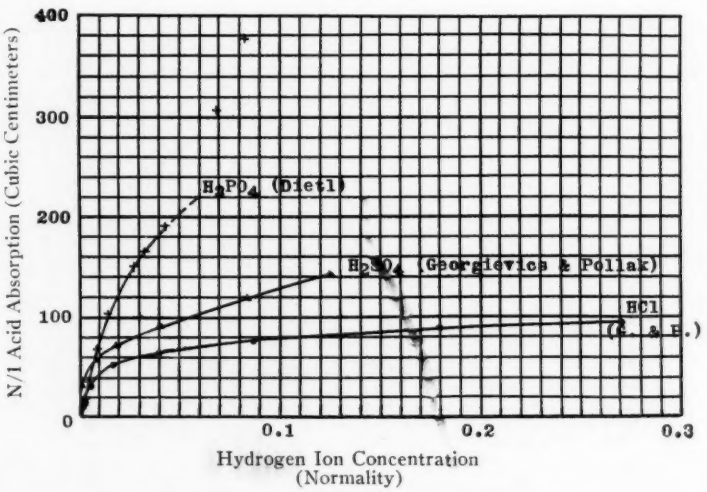


FIG. III.—*The Absorption of Acids by Wool*

with Georgievics' work, we will consider Speakman's paper at this point and out of its chronological order. Speakman, by means of Georgievics' data just quoted, was able to show that Georgievics' "adsorption and solution of acid by wool is really a combination of the acid with the wool in which the hydrogen ion concentration of the remaining solution is the controlling factor. The curves for hydrochloric and sulphuric acid in Fig. III are based upon Georgievics' and Pollak's data. The curve for phosphoric acid is based upon the work of Dietl, *Kolloid Z. 14,* 319-21 (1914). Fig. IV is based upon Fort and Lloyd's work, *J. Soc. Dyers and Colourists 30,* 5 (1914), which follows later.

Speakman points out that as the experimental proceedure of Georgievics and Fort and Lloyd were somewhat different, their results vary somewhat and are therefore only comparable among themselves. It will be noticed that the general shape of these curves corresponds very well with those of Loeb on gelatin, Fig. II, "Protein Compounds—II."* Here again the phosphoric acid is absorbed more than sulphuric or hydrochloric acids. While the curves for the latter two acids are closer together, S. points out that if phosphoric acid and sulphuric acids act as tri- and di-basic acids respectively, at the concentrations under discussion, then according to the chemical hypothesis of combination, all three curves should be identical. Both Loeb and Bogue are quoted in "Protein Compounds—II," as showing that they do not act as tribasic or dibasic acids, respectively, but act in the main as monobasic acids. Speakman says that as the concentration of the sulphuric acid increases, it acts more and more as a monobasic acid. This is plainly shown by the curves of Fig. III. As the concentration of the acids increase, both sulphuric and phosphoric act more and more as monobasic acids and their curves deviate further from that of hydrochloric acid. With fairly high concentrations, three times as many cubic centimeters of normal phosphoric acid are required as of normal hydrochloric acid to bring the wool to the same hydrogen ion concentration. Table XXIV also brings out this point.

TABLE XXIV

Ratio of Normal Phosphoric and Hydrochloric Acids Required to Bring Wool to the Same Hydrogen Ion Concentration

Hydrogen Ion Concentration (Normality)	C.c. Normal Phosphoric Acid Absorbed	C.c. Normal Hydrochloric Acid Absorbed	Ratio
0.01	76	44	1:73
0.02	123	56	2:20
0.03	157	62	2:54
0.04	183	66	2:78
0.05	202	68	2:98
0.06	218	71	3:07

Speakman, *J. Soc. Dyers and Colourists 40,* 410 (1924).

*American Dyestuff Reporter 15, 575 (1926).

The same reasoning may be applied to oxalic acid. As theory demands, oxalic acid acts as a monobasic acid over the greater part of the range covered by Fig. IV, and therefore twice as many cubic centimeters of the normal oxalic acid as of normal hydrochloric acid are required to bring the wool to the same hydrogen ion concentration. Speakman brings this out very nicely in Table XXV.

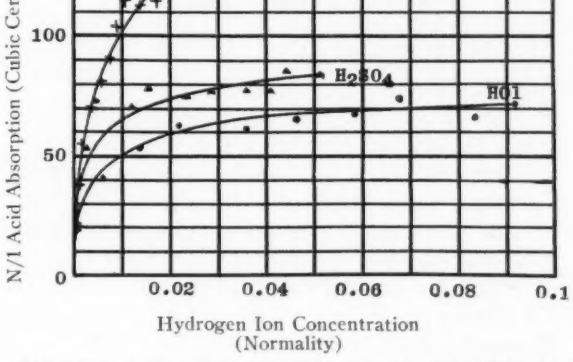
TABLE XXV

Ratio of Normal Oxalic and Hydrochloric Acids Required to Bring Wool to the Same Hydrogen Ion Concentration.

Hydrogen Ion Concentration (Normality)	C.c. Normal Oxalic Acid Absorbed	C.c. Normal Hydrochloric Acid Absorbed	Ratio
0.005	79	42	1:88
0.010	102	51	2:00
0.015	117	56	2:09
0.020	126	59	2:14
0.025	132	62	2:13

Speakman, *J. Soc. Dyers and Colourists 40,* 410 (1924).

Speakman further says that "Georgievics' data for oxalic and hydrochloric acids lead to the same result. The agreement of these results with the theory of chemical combination is therefore perfect within the limits of the experimental error of the absorption data. It is now perfectly clear why one acid is absorbed more than another, and if the acids are placed in order of increasing absorption for the same hydrogen ion concentration a perfectly intelligible result is obtained. Contrast this with the entire lack of sequence obtained when the acids are placed in order of increasing absorption for the same concentration of acid (grams per liter). The weak acid oxalic is absorbed more than the strong acids sulphuric



Speakman, J. Soc. Dyers & Colourists 40, 409 (1924), from data by Fort and Lloyd, Ibid. 30, 5 (1914).

FIG. IV.—*The Absorption of Acids by Wool*

and hydrochloric while these in turn are absorbed more than the weak acids, formic and acetic (Fort and Lloyd, *loc cit.*). It is evident, therefore, that the process of absorption of acids by wool is one of chemical combination and it is therefore more than probable that the dyeing of wool and silk by acid and basic dyes is due to chemical forces and changes."

(*This is the first half of the tenth paper of the series on "Wool" by Charles E. Mullin. The second part, continuing the review of the literature on the action of acids on wool, will appear in an early issue.*)

Uneven Dyeing of Rayon Fabrics

Different Types of Rayon in Same Piece—Nature of Dyestuff—Improper Dyeing—Presence of Foreign Matter

By A. A. Cook,

Chemist, United States Testing Company, Inc.

UNEVEN dyeing is quite frequently met with by the manufacturer of rayon fabrics. It is often encountered when every care has, apparently, been taken, but when ignorance of some preceding process of manufacture is responsible for the difficulty. The following notes suggest a few causes that have been located by careful laboratory tests. The results are offered here as suggesting, not only the different ways in which care may be exercised, but also the practical value of reliable tests on all such goods.

Causes of Uneven Dyeing

1. *Different Types of Rayon in the Same Piece.*—Unevenness due to this factor is usually characterized by regular streaks following either the warp or the filling. It is often the case that a manufacturer having a small amount of a certain yarn left over will mix this in with a new lot of a similar yarn in making up a piece of goods. If one lot is rayon of the viscose type and the other is Tubize, this fact will be very evident after dyeing. As a rule, rayons made by different processes take the same dyestuff differently either in depth or shade. Furthermore, the same type rayon made by different mills may not take the same dyeing in such a way as to give an exact match of shade. In some cases it may be very far from this, as in the case of a recent comparison of a sample of American viscose with some viscose of Italian origin. The depth of shade produced on the American sample was about three times that on the Italian on dyeing in the same bath for the same length of time.

It has also been found that rayon yarns of different filament counts dye up differently. Let us assume that two lots of rayon of the same type from the same mill are mixed in producing a piece of material and that after dyeing regular streaks are noted. Examination of the yarns show that one contained twenty-four filaments while the other had a considerably greater number.

It is inadvisable, therefore, for a manufacturer to mix different lots of rayon unless he knows exactly what he has. If he uses rayon of the same type, made by the same manufacturer and of exactly the same construction, there is little chance of trouble on this score. In practically all mills the dyeing quality of their product is checked up so that there is little or no variation from day to day.

2. *Nature of the Dyestuff.*—It is known that certain dyes have a tendency to go on rayon unevenly. It is a sound policy, therefore, to avoid the use of such dyes. There are lists available giving the dyestuffs most suitable for rayon on account of the ease of producing level shades.

3. *Improper Dyeing.*—Sometimes unevenness of shade results from a sheer lack of care in the dyeing operation. The proper control of the dyeing of any particular type of color must be learned through experience on the part of the dyer. Vat colors such as the Indanthrenes offer particular difficulties, and their successful application comes only as the result of many trials and practical experience.

4. *Presence of Foreign Matter.*—During the various processings undergone by rayon yarns and fabrics, they may acquire, accidentally, foreign material of various kinds. This may result in local or spotty unevenness, such as a tendency to resist the dye. There are many types of such foreign matter coming from a variety of sources, but practically all may be avoided if suitable care is used throughout the handling of the rayon material. A few are enumerated below:

Mineral oil not completely removed in scouring.
Insoluble or lime soaps from the use of hard water.
Impurities occurring in low quality oils and soaps.

BUREAU OF STANDARDS ANNIVERSARY

A celebration of the twenty-fifth anniversary of the Bureau of Standards of the Department of Commerce is just announced. On Saturday, December 4, next, the Bureau will keep open house and a banquet will be given at which the many friends of the Bureau will meet the staff and reminiscences will be exchanged, the achievements of the quarter century will be reviewed, and the present and future work will be discussed. A group of distinguished guests will attend. The event is of interest to the world of science and as well to the industrial experts who have worked so closely in co-operation with the Bureau and in turn made application of its discoveries and developments in perfecting the measured control of processes. The opportunity to inspect the experimental research facilities of the Bureau will be welcomed by its many friends.

Technical Difficulties in the Print Works and a New Aid to Their Solution

Underlying Causes of Trouble in Printing—Improved Thickening Material Not Sufficient—Alkaline Color Pastes Build Metal Soaps—Trouble from Lubricating Agents

By DR. G. TAGLIANI

HOW often in the course of his daily tasks the color chemist is required to hurry to the printing machine, on account of the unsatisfactory working of a print color and how often he is obliged to adjudicate upon the diversity of opinion between the printer and the color mixer, is only too well known to those who have charge of a print works. How often a chemist may be called to account by his superior and made responsible for incorrectly printed material, is not a question for me to here enlarge upon. Certain it is, however, that many faults which are not readily understandable, do arise during the printing, in spite of the greatest care in the preparation of the color. One may conjecture without being convinced, that the cause is due to this or that property of the thickening or to some decomposition, or perhaps some precipitation in the print color and may find that it is not always easy to ascertain the proper means of correction. Many faults, indeed, escape the notice of the color chemist, owing to the many duties of his daily work, faults which he has not always the time to fully examine.

In many cases when a print color works badly with the doctor, smears the roller and consequently the material, and embeds itself into the engraving, the machine is stopped and new color introduced, if such is at hand. More often the needed color is rapidly sieved, or an addition of oil and turpentine is made to it, the color box is cleaned out, the rollers made spotlessly clean, the doctor resharpened and adjusted to a somewhat sharper position and the printing recommenced. On starting all may be well and the printer feels satisfied that lost production can be recovered, but this does not always prove to be the case and the trouble again occurs. The printer endeavors to keep the engraving clean by means of a brush during the running, but the result is still not desirable and the machine is once more stopped. The printer returns to the color shop, where, in the meantime, a new color has been prepared and probably modified, a new thickening chosen, the paste made thicker or thinner until at last, through one alteration or the other, improvement is made. The consequence of such happenings during printing is highly unpleasant, for they give rise to waste through the following causes:

1. Stoppage of the machine with delay in the work.
2. Waste of color.
3. Spoiled material.

All of the above is accompanied with much anxiety and many bitter moments for the color chemist, for the printer and for the color mixer.

I have pictured here only a simple example, but could still enlarge upon the possible clogging of the engraving by the print color and the irregular results following thereon; trembling and shock to the doctor; smearing of the roller; hard accumulations over and under the doctor; scratches on the roller and doctor and other unpleasant experiences which cause the color chemist much thought and labor.

In talking over such experiences with other colleagues, and they are common to all, it is indeed pleasant to learn of new methods that will overcome the trouble.

Where is one to seek for the cause of such disturbances in the printing? It is certainly not sufficient to choose an improved kind of thickening material or to prepare a print color according to the best rules of the art, that is, to prepare and stir till cold, to sieve carefully, or under certain circumstances to grind finely. Nor is it sufficient to be assured that dyestuff and discharge salts in the printing paste are thoroughly dissolved and pigments well distributed. No, one must be convinced that the color paste is as fully homogeneous as it is possible to make it; that the same viscosity and volume is maintained; that during storing, no separation occurs or, any change of consistency through drying; further, that no mildew forms, or mouldy crust. Only then can a print paste work to the satisfaction of the chemist and the printer.

The aid which it is possible to give to a badly working print color while running is not always the best. Decisions are formed too hastily to allow a sufficient reflection in order to entirely remove the trouble. Many faults are to be sought in the color shop for errors made there often only first appear during the printing; but many also in the actual recipe followed in the preparation of the color paste itself. Strongly acid and oxidation colors and discharges change the character of the thickening, causing it to froth; destroying or saponifying the oil they may contain and resinifying the turpentine, thus clogging the doctor and engraving, attacking the edge of the doctor and so on. On the other hand, there are weak alkaline color pastes containing metal oxides of a basic character or in colloidal form in suspension, that, in conjunction with the oil tend to build metal soaps and so prevent the oil serving any further useful purpose as a lubricating medium, accompanied by clogging of the engraving and

smearing by the roller. Should the color paste be strongly alkaline, then it is quite unserviceable to make an addition of oil to it for this is quickly saponified and the whole is given a lumpy character; the doctor not being able to crush it, it smears and the paste embeds itself into the engraving. In strongly alkaline thickenings certain thickening agents become hardened, particularly when the same have been permitted to stand for a time. If there is added to these color pastes a large amount of turpentine, the alkaline nature of the printing paste will not prevent the resinification of the turpentine. The doctor now gives rise to a further trouble; it generates an electrical current which probably results in the "grinding" of the copper rollers by the doctor, so that work becomes entirely impossible.

One may recall here the difficulties which have arisen in connection with print pastes containing sulphide of soda or chlorate, or are rich in kaolin and zinc oxide. The colorist often experiences with those recipes which have the appearance of the utmost simplicity, the greatest difficulty and trouble in discovering the best means of rectifying any faults that may occur.

Trouble from Lubricating Agents

Is it possible to improve the working properties of a print color quickly and simply? If one can turn to assistants which possess the safeguarding properties, to be later described, then, is it without doubt possible. Oils and fat emulsions, however they may be prepared, must be discarded. By cutting out wax and stearin soap, petroleum, turpentine, and allied products and replacing them by other and more scientifically correct materials an unquestioned advance is achieved. These lubricating agents (castor oil, Turkey Red oil, olive oil, wax and stearin soap) and the scum prevent medium turpentine, and, by reason of the composition of a print paste and through the action of the air are most guilty of the greatest change, so that they can no longer perform the duties required of them.

I am obliged to pass over the many indirect consequences of such additions although they can be fully appreciated, as for instance, the oxidizing action of a print paste or discharge, increasing the acidity of the oil at the expense of the discharging properties; the conversion of the turpentine into tarry perterpenes. A print paste so altered must cease to work in a satisfactory manner; it froths, increases in volume, attacks roller, doctor and engraving and raises such difficulties that it can only be further employed for reduction purposes with new thickenings.

If insoluble pigments are in use, the results are still worse. Even in the case of a simple print paste of zinc white for linings containing fat emulsions and turpentine such troubles cannot always be prevented.

How often one has to deplore the insufficiently perfect white of the unprinted portions of the material or the slight smearing of certain pieces as a consequence of the gradual contamination of the roller during printing.

It would be an exaggeration if I were to say that it is possible to immediately remove every fault in printing and thus obtain only perfect results. However, one can affirm that in print pastes to which has been added a hydro-carbon of high viscosity which does not lend itself to easy chemical substitution, no decomposition will arise and the majority of the faults will be greatly modified or, in many cases, entirely removed.

Such an assistant we must recognize in Printogen which may really claim to be the best assistant for thickenings and print pastes after discarding the decomposable oils and turpentine used up to the present. When Printogen has been added to a print paste there is no fear of any attacking of the steel doctor or the copper roller whether the print paste is strongly acid or alkaline, whether it scums or not. Further, there is no fear of grinding, discoloration, smearing nor scratching of the same, nor insufficient imprint due to the unreadiness of the color to leave the engraving. The design is clear and sharp in contour. The quantity of Printogen necessary for one kilo thickening is from 10 to 25 c.c. Where necessary, larger qutntities may be employed, without materially adding anything to the cost of the print paste, since the usual oil and turpentine are omitted. The real proof of the virtue of Printogen can only be substantiated by practical work as small tests, such as can be made in a laboratory, are not of great service. My experience is, that once Printogen has been introduced and appreciated, it continues to replace all other lubricants.

SPRING MILLINERY COLORS SELECTED

"Castilian Red," a bright scarlet, "Blue Turquoise," a light sky blue, "Meadowpink," a raspberry shade with faint purplish tint, and "Golden Poppy," a brilliant Spanish orange, are four of the fashionable mid-season colors to be featured for winter resort and early spring millinery, selected by the Color Conference of the Eastern Millinery Association's Trade Development Committee in co-operation with the Retail Millinery Association. All the twenty colors chosen for winter resorts hats were selected from the Spring 1927 Color Card of the Textile Color Card Association. The colors were named by Mrs. Margaret Hayden Rorke, managing director of the association.

"Castilian Red" is much more brilliant than the popular Chanel Red of the fall season. "Blue Turquoise" is a more jewel like shade than "Valencia" blue, while "Meadowpink" repeats the modish wine tone in a much pinker hue.

New shades which will be emphasized are "Athenia," dull Pompeian red, and "Vert de Gris," a grayish green blue. The beige tones still in vogue are listed on the Textile Color Card as Mother Goose No. 1 and No. 3, light tan hues, "French Beige," a light brown and "Monkey Skin," a slightly rosy tan.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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THE TARIFF FIGHT DEVELOPS

FEW subjects have created more difference of opinion among American business men than the tariff manifesto published three weeks ago. The document, signed by a group of European and American bankers, strongly advocated the lowering of tariff walls and other trade barriers, ostensibly that Europe may regain its prosperity. The narrow policy practised by each European nation of setting up high tariffs to foster home industries, the manifesto charged, has brought on a state of general depression abroad. The only remedy, from the bankers' viewpoint, is the removal of these trade restrictions.

Free traders in this country vigorously applauded the principles of this rather startling appeal on the ground that they applied to us as well as to Europe. But they were quickly overwhelmed by the opposition, who pointed out the breach between Europe's living conditions and those prevailing here. Both President Coolidge and Secretary of the Treasury Mellon ably supported this attitude, affirming the general opinion that the manifesto was addressed exclusively to European countries. Even one of its signers stated that the plan as outlined in no way referred to American tariffs, either by allusion or inference.

That the manifesto was a direct attack, intentional or otherwise, on the American tariff, however, seemed to be the opinion of many authorities. Unquestionably there exists here strong sentiment against our tariff, and the impetus given to such sentiment by the bankers' document makes it a menace to American industry that cannot wisely be ignored. The Journal of Commerce, approving the ideas expressed in the manifesto, alluded to our own tariff as "the most extreme tariff arrangement this country has ever known, perhaps the worst any country has ever known." Any reaction of this kind might become so intense as to influence the next Congress to consider ways and means of poking holes through this country's tariff policy.

To both the textile and the dyestuff industries the problem has some interesting sidelights. Among the signers of the tariff manifesto were a number of prominent European textile men. This element, of course, has good reasons for wanting our tariff lowered. The United States is their largest customer and they can be expected to throw every argument at their disposal into the fight against our tariff.

In Germany not long ago an American observer was told by a spokesman for the German dye cartel that American-made Sulphur Blacks were being dumped on the market there and sold to Chemnitz hosiery manufacturers. The correspondent's report was quoted in these columns at the time and it was pointed out that such information will be used here to strengthen the movement for a downward revision of the American import duty on dyes. The incident has much greater significance now.

By what specious reasoning can proponents of a lower dye tariff hope to put over their principles in this country? Can they explain how our present tariff schedules can be considered as prohibitive, when our dyestuff imports, according to the latest Government census, arose 72 per cent last year over those of 1924? Nearly half of those imports, moreover, consisted of vat dyes and other higher-priced types. "Pronounced competition from imported dyes," says the Tariff Commission's report on this subject, "has been manifest, particularly for the higher-cost types." The low tariff howlers should note that this condition was intensified by the drop in the ad valorem rate two years ago.

Any sudden increase in this competition would obviously count heavily against the American dye industry, which could not long thrive without a sustained trade in the finer types of colors. Ultimately the dye consumers, too, would be injured, were they to withdraw their support of the domestic industry, for any small saving gained by the exclusive use of the imported products would only be temporary. Consumers and manufacturers alike, therefore, should not fail to recognize the growing opposition to the tariff that protects them and be alert to the strategems of those agencies who seek to destroy that protection. By vigilance, and by concerted action when the subject of tariff reduction comes up in Congress, they can counter the expected revision by urging stronger protection for the higher type colors.

ARBITRATE!

IT is often necessary to pin a man down by sheer force in order to administer the medicine that is good for him. Business is figuratively being pinned down to more common-sense practice by the power behind a nationwide campaign urging the settlement of commercial disputes by arbitration.

To the American Arbitration Association should go a large share of the credit for this lively interest in arbi-

tration, for it has been the guiding spirit of the movement. By its ceaseless pounding on one idea—the benefits of arbitrating as opposed to legal court procedure—it has driven it into the consciousness of thousands of business men in every branch of industry and trade. The response has been overwhelming. Like an infection its doctrines have spread among trade organizatione everywhere, among business leaders, educational bodies, Government departments, until to-day arbitral practice has been formally set up in forty States.

The board of governors of the American Arbitration Association, composed of eighty members, represents every geographical section of the United States and every branch of business activity. Behind these industrial leaders is the active support of the Department of Commerce, of sixteen educational institutions and upwards of 250 trade organizations, chambers of commerce, and boards of trade, including such bodies as the American Association of Woolen and Worsted Manufacturers, the Silk Association of America, American Cotton Waste Exchange, Associated Dress Industries of America, American Paper and Pulp Association and hundreds of others.

Many of the industries and trades represented are fully equipped for commercial arbitration through systems installed by the trades themselves. The number of cases disposed of in this manner during a year range from forty or fifty handled by the Silk Association of America to 11,000 complaints settled in the motion picture industry. The Shoe Manufacturers Board of Trade of New York recently contributed $2,300 to the Arbitration Association for the promotion of its good work.

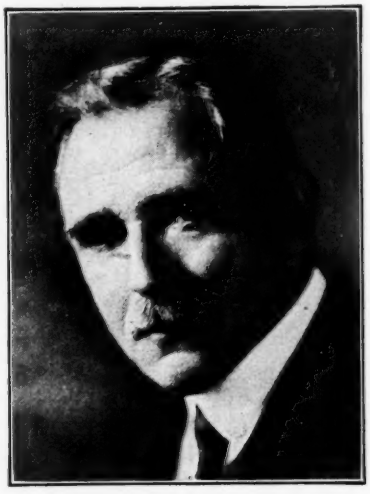
These facts and figures in themselves may not be very colorful, but they point to a fast-growing disposition among business men to avoid expensive, time-wasting litigation wherever and whenever their disputes can be successfully settled by arbitration. The movement deserves the earnest support of every business man in this country.

COLONEL METZ GIVEN TESTIMONIAL DINNER

H. A. Metz, president of the General Dyestuff Corporation and H. A. Metz Laboratories, was tendered a dinner by his associates on October 22 in the University Club, New York City, in celebration of forty-five years' distinguished service in the chemical industry.

Almost all of those attending had something interesting to say in appreciation of their business relations with Mr. Metz. Dr. Wilfred Greif, of the Farbwerke vorm. Meister Lucius & Bruening, fittingly expressed the sentiments of his firm in telling how highly esteemed it had held Mr. Metz during all the years he was in close business contact with them. They presented him with a silver plaque and a silver table service as tokens of their long friendship.

The Farbwerke ceased their corporate existence the beginning of this year, when they, together with the other large German concerns, were absorbed by the I. G. Farbenindustrie Aktiengesellschaft, whose products, so far as they come into consideration for the dyeing and printing industries, are handled by the General Dyestuff Corporation.



Mr. Metz expressed himself as being particularly gratified by the presence of Adolph Kuttroff, and said that he had always considered Mr. Kuttroff as a guide and preceptor during all his business life, and one whose example he hoped all young men in business would follow. He called attention to the fact that when his associates celebrated his twenty-fifth anniversary there were over sixty present and out of that number about twenty-five had passed away. He hoped that all those present at his forty-fifth anniversary will be present should he celebrate his fiftieth.

On October 22, 1881, Herman A. Metz entered the employ of P. Schulze-Berge as office boy. The present corporation which he heads traces its direct descent to the business originally founded by P. Schulze-Berge, having been succeeded by Schulze-Berge & Koechl, Schulze-Berge, Koechl & Movius, Victor Koechl & Co., H. A. Metz & Co., Farbwerke-Hoechst Company and the General Dyestuff Corporation, which became affiliated with the long-established dyestuff business of Kuttroff, Pickhardt & Co. and the Grasselli Dyestuff Corporation.

H. T. Fleitmann, of Fleitmann & Co., Inc., has been elected chairman of the dinner committee which is arranging for the annual dinner of the Silk Association of America, Inc. The date has been set for January 8, 1927, and the grand ballroom of the Hotel Astor has been reserved. This will be the fifty-fifth dinner in the history of the association.

PHILADELPHIA TEXTILE SCHOOL LINES DYE KETTLES

The REPORTER has been favored with the following communication from Prof. Elmer C. Bertolet, of the Chemistry and Dyeing Department of the Philadelphia Textile School, describing a new installation of metal lining in four of its dye kettles:

"During the past summer the Chemistry and Dyeing Department of the Philadelphia Textile School, in co-operation with the International Nickel Company, has lined four additional kettles with Monel-metal. This, with the one kettle previously lined, brings the total of lined kettles to five. It is the intention to further increase this number in the future, as soon as we are able to witness the service this Monel-metal lining will give when applied to our varied needs. The lining of the kettles was done by the Liberty Coppersmithing Company, of Philadelphia.

"Our Dyeing Department bears the same relation to the various departments of the Philadelphia Textile School as this department would bear to the mill in the industrial world. It is called upon to dye various materials in various forms and with dyes of the classes necessary to meet varying requirements of fastness and shade. In this work, raw stock, skeins and piece goods are thus processed with almost every variety of dye at present commercially used. Our varied needs likewise put a severe test upon the utility of Monel-metal as a lining for the varied requirements encountered in the application of dyestuffs in the industry.

"With wooden kettles, one is positive that there will be no effect upon the dyes from a chemical standpoint, the dyes producing results similar to those dyed in porcelain or glass. However, with wooden kettles much trouble is encountered, because of the variety of work which we do, in having the kettle clean from one lot to another. Particular trouble is experienced going from dark to light shades and from the dyeing of cotton to the dyeing of wool, etc. This trouble is obviated to a very large extent by the linings of Monel-metal that we have installed. Another big advantage is the smoothness of the sides of the kettle, enabling us to work the most delicate material without the danger of its becoming frayed or broken.

"The lining of Monel-metal used in this work was 0.031 inch in thickness, soldered in the seams with silver solder. The metal is brought over the top of the kettle and tacked down about 2 inches over the sides with copper tacks. Each kettle is fitted with a perforated Monel-metal false bottom of 0.078-inch sheeting, put up on cleats so that it is about 3 inches from the bottom and easily removable for the cleaning of the kettle. The kettle is fitted with a 1¼-inch outlet at the bottom to run the liquor to the drain, and an overflow pipe comes through the far end of the kettle about 2 inches from the top in the form of a short nipple of ¾-inch pipe to which the overflow pipe is attached on the outside of the kettle. The steam pipe is made of ⅜-inch or ¾-inch Monel-metal, the size depending on the size of the tank. Steam is brought through the bottom of the kettle and the steam pipe runs straight across the middle throughout the whole length of the kettle. It is attached to a 5-inch nipple of Monel-metal, which passes through the wood and on the outside is attached to the brass steam lines of the steam supply. This nipple is held in place with lock-nuts, the one used inside being made of Monel-metal. The steam pipe is perforated with 1/16-inch holes bored completely through the pipe every 2 inches. The pipe is held in place by a cleat fastened to the bottom of the kettle.

"We have had some opportunity to try out these kettles, and have had good results with them in the use of vat dyes on cotton. About forty lots of wool have been dyed in them with acid and chrome colors with good results. We have not had sufficient time to draw any definite conclusion along this line, because we have experienced some difficulty in having chrome colors work as they do in porcelain. This, of course, is to be expected when dyeings are made in acid baths. It might be that the metal was somewhat oxidized on the surface and a greater action obtained than would have been otherwise if in practical everyday use. This has not been very serious, and we believe that with a proper selection of dyes a minimum of trouble will be encountered at this point. It is well known that the presence of metal in the case of chromate and afterchrome methods in some way prevents the chrome from developing the dye to the fullest extent. In neutral and alkaline baths (especially alkaline) we would expect good results at all times from the use of this metal.

"The lining of these kettles has given us a flexibility that we did not possess formerly. It has made the passing from one lot to another a matter of ease."

DR. HERTY RESIGNS AS PRESIDENT OF S. O. C. M. A.

Dr. Charles H. Herty has resigned the presidency of the Synthetic Organic Chemical Manufacturers Association of the United States, effective November 15, 1926, in order to assume the duties of adviser to the Chemical Foundation, Inc. Dr. Herty will devote his entire time to the work of the Chemical Foundation at the offices of the Foundation, 85 Beaver Street, New York City.

For the present an executive committee of the board of governors will be in charge of association activities.

Harold W. Doyle, from Norristown, Pa., has taken charge of dyeing for the Phoenix Woolen Company, Stafford, Conn

SOUTHERN TEXTILE EXPOSITION LARGEST YET HELD

The textile exposition that opened with a whir and click of machinery in Textile Hall, Greenville, S. C., on Monday, November 1, before the close of the week proved to be the largest, liveliest and by far the most interesting in attendance, exhibits and diversity of products that has ever been held in the South.

Although no really outstanding developments in the industry were shown this year, the exhibits in general included a number of new features in textile equipment that depicted the important mechanical advances made during the past two years. The display of looms and warps, power machinery, mill equipment, apparatus and supplies, mechanical devices and textile fabrics of every variety was, to those who attended, a vivid spectacle of ceaseless accomplishment in striving to make American textile mills the most productive and efficient in the world.

The individual exhibits, on the whole, showed that the textile equipment industry has not been standing still. Definite improvements in loom construction were largely featured, particularly in the adaptation of weaving machinery to rayon. New developments in long-draft spinning and high-speed warping were likewise among the notable examples of mechanical progress displayed.

Of particular interest to the dyers and chemists who attended the Southern Textile Exposition were the booths maintained by the Ciba Company, Inc., New York; E. I. du Pont de Nemours & Co., Wilmington, and the National Aniline & Chemical Company, New York. The demonstration of a new de-lustering and re-lustering process by the makers of Celanese, the American Cellulose & Chemical Manufacturing Company, also attracted a number of visitors to their booth.

The exhibit of the Ciba Company consisted of an eight-compartment warp-dyeing machine in operation, dyeing different colors during each day of the show, on long chain warps with Ciba dyes. The machine, built by the Cocker Machine & Foundry Company, boiled out the warp, colored it, washed it after drying, and dried and coiled the yarn ready for the beamers. Diazotized and developed colors and naphthol colors were employed on this machine during the exposition, illustrating the ease with which the Ciba and Cibanone dyes could be completed in one run on cotton and ryon. A new series of Cibacet colors for Celanese and a colorful display of dyed fabrics were also interesting features of this exhibit, which was in charge of William Mitchell, sales manager, assisted by Southern representatives and technical demonstrators.

Edward L. Talbert, last employed in the Talbot Mills of North Billerica is now overseer of dyeing in the Dunn Worsted Mills, Woonsocket, R. I., succeeding Gusten Nordenstierna who resigned last month.

ON THE FASTNESS TO LIGHT OF NAPHTHOL COMBINATIONS

(*Continued from page 750*)

Naphthol AS-RL—Fast Red RL Base

1. 4-5
2. 5

This proves conclusively that the degree of light fastness is a function of the more or less intensive hot aftertreatment and is independent of the presence of free naphthol or base residues.

Reviewing the individual series, it is noted that in the first series of experiments a boiling hot aftertreatment is of great importance in the case of the combinations Naphthol AS—Fast Red GL Base and Naphthol AS-SW—Fast Red KB Base, while in the case of Naphthol AS-RL—Fast Red RL Base the action of heat on the fastness to light does not appear very important. It is interesting that in the combination Naphtol AS—Fast Red GL Base a five minute boiling hot rinsing (Series I, No. 3) is sufficient to produce a considerable increase in fastness. The fastness of Naphthol AS-SW—Fast Red KB Base is only improved after a one-half hour boiling soaping, and is accompanied by a change to a bluish shade of red.

Naphthol AS-RL—Fast Red RL Base merely rinsed cold has the same fastness as Naphthol AS—Fast Red GL Base soaped one-half hour boiling hot.

Series II and IV show that the hot weakly alkaline aftertreatment has an influence on the fastness to light and the presence of considerable amounts of free naphthol or base residues is of no practical importance.

PONSOL ORANGE PASTE ANNOUNCED

A new and important addition to the Ponsol series, Ponsol Golden Orange 4R Paste, has been announced by the dyestuffs department of E. I. du Pont de Nemours & Co. It produces very reddish or orange shades, being particularly valuable for shading browns, tans, etc., in combination with other Ponsol dyes.

This new color is described as being level dyeing, and suitable for cotton in any form, rayon, silk, linen, etc. It is further said to be practically unaffected by water, washing, perspiration, stoving, acids, alkalies and chlorine, and to possess remarkable fastness to light. It is suitable for use on all types of machines. On both silk and rayon, according to the description, it has great brilliancy, the fastness on silk being equal to its fastness on cotton. It reduces easily, being suitable for printing on both cotton and silk.

Harrison F. Wilmot, formerly technical adviser to the Synthetic Organic Chemical Manufacturers' Association, has joined the organization of A. Klipstein & Co., New York. He will have full supervision of their technical laboratory and customers' service department.

The Dyer's School of Experience

[EDITOR'S NOTE.—*The following narrative is one of a series being published under the general head of "The Dyer's School of Experience." Realizing that the genuine material for such a series is to be found largely among its own readers, The* REPORTER *solicits contributions from that source and will pay for those accepted at regular space rates. Among the readers of this journal there should be many who have, in the course of their experience as dyers or chemists, encountered incidents which should prove most interesting and helpful to their fellows. Send all manuscripts to* AMERICAN DYESTUFF REPORTER, *90 William Street, New York City.*]

A FEW PERTINENT "PARABLES"

By NOEL D. WHITE
Davenport Hosiery Mills, Chattanooga, Tenn.

THERE is so much of interest in the daily life of the average dyer that it is surprising to me there are not others in the fraternity who care to take up the pen and write their experiences. How they got over some difficulty, how they had to shoulder the blame for someone else's blunder, how they "passed the buck" to someone else, or vice versa: I am sure that such episodes would make very interesting reading.

That is the purpose for which this column has been started. This is our column, this is the place where we can air our grievances, where we can tell the world of our trials and tribulations, of what we have to go through in our daily task, of our successes and failures, so that members of the dyers' fraternity may profit by each other's experiences.

When the editor of this magazine asked me to start this column I did not anticipate that I was going to monopolize it altogether, and I sincerely hoped some other readers would help to keep it going.

Here I take occasion to congratulate our brother, George L. Baxter, of New York, for his contribution in the June 14th edition. Come again, Brother Baxter!

This time I am going to relate some episodes which I believe will be of interest to the young men starting out to make dyeing their life work.

Whether they start working in the dyehouse after graduating from college, or some textile school of technology, or from the school of hard knocks, from which I graduated, when they enter the dyehouse in any capacity, usually they get behind some old dyer, either a relative or a friend, who is in charge of the work and from him they are guided in the preliminary steps—and here is where the young men become acquainted with real practical work.

The beginners must learn a good many things that are not obtained in any school: How to correct shades that have gone wrong, colors too dark for a good match, uneven goods, formulas that won't always work uniform, and how to overcome all kinds of difficulties that in one way or another always present themselves.

They can watch the old man and go to him for advice when they are in trouble—or think they are in trouble when as a matter of fact they are merely short of experience.

I was working in a large plant in New Jersey, dyeing silk and silk mixtures, piece goods. Here I was one of a number of dyers who worked under a department foreman. Each dyer had a number of vats for his use and would get his work from the gray room, suitable for his style of vats and machines.

Being the latest arrival at that plant I was dyeing all single pieces with a hand reel, one man to each vat, with twelve vats at my service.

One day I picked out one piece to dye that was marked on the ticket: Sample-Catawba. Upon inquiry I found that it meant the piece was a new weave sample, and was to be dyed Catawba without any sample to match by. It was a very hard and thick crepe of cotton and silk.

I hunted up a sample card showing a shade of Catawba and went to work. When I thought I had a good match I put my piece in the dry room. The following morning the inspector came to tell me my piece was no good—all uneven. I went to look at it and it surely was a sorry looking specimen; but I came to the conclusion that being such a hard piece of material, it could not be dyed loose and had to be dyed under tension in a type of machine that we had there, though not in my department. Wetting had shrunk that piece all out of shape and its unevenness did not surprise me. I showed the piece to the foreman, telling him what I thought about it. He told me I should not have taken it in the first place, but since I started it I had better do the best I could with it.

This place was my first venture in piece dyeing. When I went to look for a job there this gentleman, after looking over my credentials, had asked me if I knew piece dyeing. I said I never saw a piece dyehouse before. "Ever dye cotton?" I told him I never did but wanted to learn. "All right," he said, "I will take you on and teach you how to dye piece goods in cotton and silk." So he knew what I could do. After hearing how I dyed that piece of hard crepe he told me to give it two boiling soap baths and then to show him a sample of the results. I did it and the result was an old rose in a uniform shade. I took a sample of this to the boss and after looking at it he said, "Now wash it, brighten it up with a little acetic acid and put it away."

"Why," I said, "the ticket calls for a shade of Catawba."

"Got any sample?"

"No."

"Well, then, that is a shade of Catawba. Put it away."

"But the Catawba I saw in the sample card is a lot darker. This will never do."

Then the old gentleman smiled and said, "Young man,

you are looking for trouble. You were in trouble when you came to me; I put you straight and you want to get in trouble again. Because it has been easy to correct the dyeing of that piece you are not satisfied."

So it was. Because it was easier to do it than I thought it should be I was not satisfied. If I had worked that piece until I had ruined it in order to give it a color more to my liking I would have been content. But the firm who sent that piece of crepe did not particularly care what color it was dyed. They only wanted to see how it looked when it was dyed.

That day the old gentleman gave me another lecture emphasizing the fact that in dyeing it was most important the work should be done the easiest and quickest way possible for best results. He made me understand that the goods we dyed were to be worn by the buyer of them and not by the dyer, and that is just what I have been trying to do ever since.

I was working in Norwich, N. Y., in a mill long since gone out of existence, dyeing silk in the skein. One afternoon I took a 25-pound lot of silk to be dyed red. It was a little heavy with the violet and the result was several shades darker than the sample. The ordinary procedure in such cases should have been to give the lot a hot water bath to reduce the color and then build it up again with some red and orange in a new bath.

But I was in a hurry, worried least the boss should see my blunder, and I thought a new bath would suffice. But it did not. A third bath made it look worse. I was now quite excited; had lost all control. Just then the boss happened along. One look at me and he knew something had gone wrong. He had told me many times that I showed my emotions in my face plainer than anybody he knew. Maybe I had missed my calling and should have been a movie actor. But as there were no movie actors in those days, I was left for the dyehouse and filmdom lost a star.

He called me and wanted to see the color I was dyeing. I told him it was not a good match yet, but he insisted on seeing it, so I brought a skein of it to him. After looking at it, he said, "You wash it good, then cover it up and leave it until to-morrow. You will finish it to-morrow morning." I started to say it was still early and I could finish it before whistle time, but he cut me short and said, "If you insist on working that lot to-night I shall take that sample away from you and finish it myself." Then he left me. I did as I was told to do and the following morning by the time the boss came down to my department I was ready with a good match for him to pass on.

He smiled all over, then he asked me how long it took me to finish it. I said, "About one hour."

"Now you understand," he said, "why I stopped you from finishing that lot of silk. I knew I was hurting your feelings but I was thinking about saving that silk, and in your state of mind last night you could not do it any good. This morning you were rested—better able to think, and you went at the job from the right angle."

It was a good lesson—one every dyer should learn.

To-day when a lot goes wrong for some reason or other, I do not keep on punishing it until it is utterly ruined. I do what I can to remedy it, but if it starts to get on my nerves I leave it for a time and go ahead with other work; I forget the bad lot until it has ceased worrying me; then I will have it out again feeling sure that I am master of the situation, and finish it without much trouble.

Some years ago I was working in the color shop of a large dyehouse in western Pennsylvania with a number of other dyers. A young man, whose father was a friend of mine, was also working there, learning to be a dyer. He was a bright chap but like many young men he was unwilling to ask advice, preferring to get over his difficulties the best way he knew, sometimes with disastrous results. One day I was watching him from a distance dyeing a lot of silk, Navy. I noticed he was matching a sample first at one window, then at another; then he would go to his lot, looking puzzled.

He was plainly excited. I could see that. I asked him what the trouble was and to let me see what he had done, and said perhaps I could help him. He said his lot had too much blue and he could not fix it because the bast soap had run out and he had to wait until the next boil-off was ready before he could have more soap to make a new bath. I asked to see it and saw right away that it was not too blue at all, but needed shading to subdue the fiery blue. His eye had not yet acquired what someone has aptly called the sixth sense, the sense of color, which every experienced dyer should have and which is acquired only after years of practice.

I told him there was nothing wrong with this color. "Put in your bath two pints of orange and half a pint of azo yellow," I instructed. "Give it five turns, then see the result."

He did that and showed the result to his foreman, who passed it as a good match.

In relating these incidents I have tried to point out some of the things the young dyer must learn.

When he has decided that he has absorbed enough knowledge and experience for a higher position and succeeds in obtaining a job where all the responsibility rests on his shoulders, then his real education begins

He may find that the water is not what it ought to be, or he may find that the manager, convinced perhaps by some malicious fool, insists that 40 pounds of steam is enough to run his dyehouse. His helpers persist in doing the work the way they had done before. He will have to change all that and many other things. But the management is interested in seeing that his work is done properly, and with time, if he can gain the confidence of his employers they will give him all the help they can to fix that dyehouse to suit his needs.

Now, when he is in trouble with his dyeing he has no

one to go to for advice and must resort to his ingenuity to overcome his difficulties and just here is where his experience, if he has had any, comes in handy. When he wants sympathy he can find it in the dictionary, but if he has ambition he can work himself out of any situation provided he keeps his head, does not let troubles worry him and keeps a file where he can record all his good work and all his failures.

Technical Notes from Foreign Sources

Sizing Textiles in Long Lengths

An apparatus for sizing textile materials, such as threads or fibers, particularly artificial silk, in which the threads are led from a roller A, shown in Fig. 1 of the accompanying illustration, between a sizing roller B and a pressure roller D over a heated plate E and thence

FIG.1.

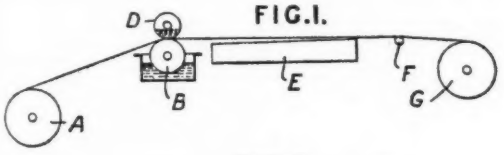
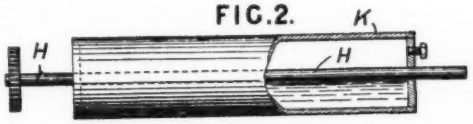


FIG.2.



through a reed F to a warping beam G, the pressure roller D is formed of a central spindle H, shown in Fig. 2, surrounded by a rubber or other resilient cylinder K, the space between the spindle and cylinder being partially filled with a liquid such as water. The rollers B and D may both be positively driven or the roller may be driven by friction from the roller B. In a modification the central part of the spindle H is cut away, the roller D being driven from both ends. (British Patent No. 254,866.)

Sizes

Sizes for textile fibers which are not sufficiently acid to burn the fibers and are completely removed in the degreasing or boiling operations, comprise a refined oil with a relatively small amount of drier boiled in linseed oil. Suitable driers are stated to be a drier acetate or resinate or cobalt oleate.

In an example a size comprises of two liters of gasoline or benzine, one liter of refined oil or extra light drier, one to ten liters of soap, benzine, light mineral oil, vaseline oil, or olive oil, thirty grams of grease, lanolin or tallow, thirty grams of pure wax or Japan wax, and optionally one to two liters of china wood oil. Certain silks may first be treated with a solution of glue, dextrin, casein, baked starch gelatin or a gum, and in certain cases the fibers, after sizing, may be treated in a softening bath of either olive oil, castor oil or mineral oil, or of benzine soap, grease, lanolin, tallow or dilute Japan wax in gasoline or benzine. (British Patent No. 254,720.)

Dyeing Cellulose Acetate Silk in Union Fabrics

Blue, red and white effects in cotton-wool-cellulose acetate silk union fabrics are obtained by dyeing the wool with a blue acid dyestuff from an acid bath, the cotton with a red cotton dyestuff at a temperature of 50 deg. Cent. in the presence of 3 per cent of Katanol W (for retarding absorption of the cotton dye by the wool), and leaving the cellulose acetate silk white. Three-color effects on similar are obtained first by dyeing the cellulose acetate silk with Cellit Fast Yellow 2GN and developing a red shade by the usual processes of diazotization and coupling (the wool being thereby stained yellow and the cotton and affected), and afterwards dyeing the wool with a blue acid dyestuff, the fabric being then thoroughly washed and the cotton dyed green or olive with a direct dyestuff in the presence of Katanol W.

Four colors are obtained on cotton-wool-natural and cellulose acetate silk mixed fabric by first dyeing the cellulose acetate silk red as described above, then dyeing the wool and silk together with wool dyes having different affinities for wool and silk under different conditions, for example, Patent Blue and Tartrazine. This is accomplished, for example, by dyeing for one-half to three-quarters of an hour at a low temperature (the silk thereby becomes dyed to a deep peacock blue), and afterwards adding sulphuric acid to the dye liquor and heating it to approximately 100 deg. Cent. The wool is thereby dyed Russian Green. Subsequently the cotton is dyed with a violet direct dye in the presence of Katanol W at a temperature of 50 deg. Cent. Three colors are obtained on cotton-viscose and cellulose acetate silk or cotton-mercerized cotton-cellulose acetate silk fabrics by previously dyeing the cotton black when in the form of yarn and afterwards dyeing the cellulose acetate silk and mercerized cotton or viscose silk in different colors by the usual methods. (Kunstseide, 1926, pages 13-15.)

Aktivin for Finishing Printed Fabrics

Neutral, transparent, homogeneous, highly glutinized starch pastes containing no dextrin, maltose, glucose or other sugar substances and suitable for finishing textile fabrics are prepared by boiling aqueous suspensions of starch (maize, rice, wheat, potato, etc.) containing approximately 1 per cent (calculated on the weight of starch) of Aktivin (sodium para toluenesulphochloroamide). The viscosity of the resulting pastes is lowered

by prolonged boiling, but no formation of reducing sugars occurs.

This method of preparing finishing pastes is superior to processes now employed in which starch is subjected to the action of diastatic enzymes, since the conditions of preparation (concentration of Aktivin and time) may be varied widely without danger of formation of dextrin and lower degradation products of starch which ultimately promote the yellowing of white fabrics during storage. Starch pastes which are prepared with Aktivin rae transparent only when hot, for insoluble starch separates when they are cooled. Transparency is regained when the paste is reheated.

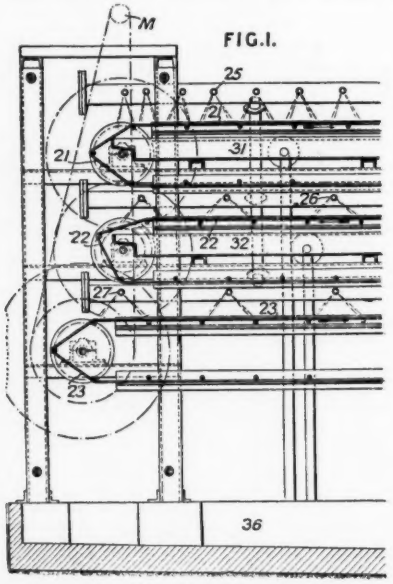
A paste which is suitable for finishing white lace curtain materials is prepared by boiling a mixture of ten kilograms of potato starch, 250 to 270 liters of water, and one hundred kilograms of Aktivin for a period of ten to fifteen minutes and then adding from one to two kilograms of Turkey Red oil, soap, or other suitable fatty substance.

A paste for finishing printed fabrics is prepared by boiling a mixture containing ten kilograms of potato starch, 80 liters of water, 100 grams of Aktivin, and 20 grams of sodium carbonate for a period of fifteen minutes, afterwards adding four liters of a 10 per cent solution of soap and one liter of Turkey Red oil. Suitable weighting substances or hygroscopic compounds, glycerine, for example, for conferring a linen-like handle to the finished fabric may be added. (Textilberichte, 1926, volume 7, pages 144-146.)

Washing or Dyeing Textile Goods

For washing or dyeing textile goods or fabrics, the goods, etc., are transported from one porous endless conveyor band 21 to other endless bands 22 and 23 situated below, being meanwhile sprayed from the tubes 25, 26 and 27. The bands are driven from a motor M at different speeds, the lowermost slowest and the middle band in the reverse direction. A greater number of sprays and sprays with larger holes are used in that part of the machine first, traversed by the goods. The first spray of a lower set is arranged to squirt off any goods that may adhere to the upper band. Trays 31 and 32 catch the liquid which passes through the upper bands; this liquid is conducted down to a side tank. Liquid passing through the lowest band collects in the tank 36. (British Patent No. 254,706.)

FIG. I.



Capillary Analysis of Dyes

Capillary analysis of dyestuffs depends on the well-known principle, first discovered by Schoenbein in 1861, that on dipping strips of blotting paper or the like into solutions containing salts or the like, the water rises higher as a general rule in the paper strip than the dissolved substance. According to other investigations it has been determined that the height to which the dissolved matter will rise depends on its electrical charge. Thus electronegatively charged substances will rise only as high as the water or approximately so, while the electropositively charged substance will rise for a short height only. It has also been established that the last named phenomenon must be assigned to the fact that the electropositive substance is subjected to flocculation on coming in contact with the filter paper.

An investigation has been made and reported in Revue Generale Matieres Colorantes, 1926, in which a very large number of dyestuffs have been tested and the results have been given therein in tabular and diagrammatic form. The general conclusions that have been derived from this research are as follows:

Under the assumption that the concentration of the dyestuff in the solution does not exceed 1 per cent and that the dye is found in colloidal solution or in only a slowly dialyzing condition, electrocapillary analysis gave the following results:

First, the acid, basic and amphoteric dyestuffs can be distinguished from one another in that the acid dyes rise almost as high as the water in a strip of filter paper. On the other hand, the basic dyestuffs rise scarcely above the level of the liquid in the container. The amphoteric dyestuffs are characterized by the appearance of vividly colored zones.

Second, the rapidity with which the electronegative and amphoteric dyes rise is greater than that of the electropositive dyestuffs.

Thirdly, the rapidity of the rise is dependent on the degree of dispersion of the dyestuff in the solution, and hence the latter is a measure of this phenomenon.

Fourthly, dyestuffs, which reduce the surface tension of the solution are Cochineal, Brilliant Green, Paris Violet and the like. Dyestuffs which increase the viscosity of the solution are Trypan Red, Sudan G, Direct Black W, Trypan Blue, Direct Gray 4B, Congo Red, etc.

Water-Soluble Magnesium and Zinc Salts of Direct Cotton Colors

Magnesium and zinc salts of the direct cotton colors which are soluble in water, are prepared and used for the dyeing of cotton and woolen materials, these salts being deposited on these fibers and being converted into the insoluble condition on drying. This enables the dyer to obtain shades which are very fast to washing.

The magnesium and zinc derivatives of the colors in question are obtained by mixing the component parts in the presence of ammonium salt or ammonia or sodium bicarbonate. However, only a very small amount of the latter salt must be added, so that the precipitation of basic magnesium or zinc compounds is avoided. When ammonium acetate is employed, it is unnecessary to add any ammonia.

The solutions that are prepared in this manner can be used directly in the dyeing of the woolen and cotton materials. It is also possible to carry out the process in such a manner that the color is brought into contact with an emulsion of freshly precipitated magnesium or zinc hyrdoxide. Then the resulting precipitate is filtered off and washed and then brought into the water-soluble form by treatment with the correct proportion of zinc or magnesium salt. The precipitation of zinc and magnesium compounds in the color liquor can also be prevented by adding to the color liquor an aqueous solution of zinc or magnesium hydroxide in ammonium chloride which also contains some free ammonia.

The dyeing is carried out in the usual manner, the goods are introduced into the lukewarm liquor and the temperature of the bath is then gradually increased. Nevertheless the temperature must not be allowed to rise above 90 deg. Cent. It is also advisable to allow the goods to cool off in the dye liquor. (Deutsche Faerber Zeitung, 1926, page 939).

Dyeing and Printing with Vat Colors

The fibers are first impregnated with a solution of a water-soluble salt of acids esters of the leuco compounds of vat colors, then they are dried and developed in a bath of iron chloride or acidified chromate at the ordinary temperature. This process is suitable for dyeing any kind of fiber, for the compounds that are used for this purpose are neutral.

In printing the neutral compounds are mixed with suitable thickening media, the fabric is printed and developed with acid oxidizing agents. Colors which are able to stand the aftertreatment with oxidizing agents can be printed on the fabric along with the vat dyes. The color paste can be made with the addition of oxidizing agents and then treated with acids.

If a fabric, treated preliminary in this fashion, is printed with thickened hydrosulphite formaldehyde and alkali, then white effects are obtained by subsequent treatment with acid. Vat dyes may be added to the white discharge pastes and then colored effects can be obtained on fabric where the ground is dyed with vat colors. The nitrites are particularly suitable as oxidizing agents. (Austrian Patent No. 101,301.)

NEW TEXTILE FOUNDATION IN GERMANY

Development of the German textile industry and trade will be materially furthered by the recent order of the German Minister of Economics to establish a special foundation for research and similar trade advancement work.

This foundation, according to German press reports sent to the United States Department of Commerce, is the result of a timely suggestion made by the employers' and workmen's association of the German textile industry. The organization proposed that a fund derived from the fees received by the Textile Control Bureau during the war and inflation periods be devoted to the advancement of their industry. The department for the control of textile raw material and goods was established by Germany during the war as a protective measure and ceased operations in the fall of last year, being the last war department to be abandoned.

NEW PEERLESS DIRECT YELLOW

A very green type of Direct Fast Yellow has been developed by the Peerless Color Company, Plainfield, N. J., and put on the market under the name of Direct Fast Yellow NN. It is described in a leaflet issued by the manufacturer and its shade shown on an accompanying swatch of cotton-wool piece goods. Characterized by brilliance and extreme fastness, according to the announcement, it is suitable for cotton, rayon, silk, wool, unions, paper, leather and other fibers and material. Wool may be dyed acid or neutral, the acid dyeing being the brighter. Silk is also dyed acid or neutral.

This new yellow is used as a self-color or for shading, in the latter use finding application in the shading of vat and sulphur colors because the sulphide reduction baths have no effect on it. The leaflet gives its fastness properties and other information.

SPRING WOOLEN COLOR CARD ISSUED

A number of interesting new shades are featured on the 1927 Spring Season Woolen Color Card issued by the Textile Color Card Association and indorsed by the American Association of Woolen and Worsted Manufacturers. One of the colors specially emphasized is Nectar, a grayish pink of slightly lavender cast. A raspberry color, named Wild Cherry, which may be one of the leading spring shades, matches Wild Raspberry on the Floss 1927-A Spring Color Card. Two reds, Troubadour, a bright scarlet, and Pigeon Blood, a deeper crimson, also shown on the card, harmonize with the Castilian Red and Goya of the Floss card.

Jasmine, a light lemon yellow for sport dresses;

Water Green, a light yellow green, and Wild Iris, a light lavender, are three shades used in recent designs. A light Pompeian red, Marsh Rose, a new shade on the spring woolen card, matches Grecian Rose on the Floss spring card.

Other unusual hues on the card are Magenta Rose, a reddish purple, and Persian Melon, a warm flesh tint. Indian Turquoise, similar to Blue Turquoise 1927, floss card, is one of twenty colors selected by the Color Conference of the Eastern Millinery Association for winter resort and early spring hats.

A UNIQUE THERMOMETER CATALOGUE

A new, attractively printed and bound catalogue of industrial thermometers that actually does catalogue them has been issued by the C. J. Tagliabue Manufacturing Company, Brooklyn, N. Y., temperature engineers. It is aptly entitled "The Tag 'Codex'," and was published for the purpose of supplying the general demand for a condensed, readable catalogue of thermometer products.

The first few pages of this new "codex" covers the construction, forms and connections of Tag industrial thermometers, explaining the red reading column feature, the internal structural design of the instruments and their principal types for meeting the varied needs of the equipment on which they are installed—all fully illustrated with interesting photographs and diagrams. The first part catalogues Tag industrial thermometers of standard construction and material, with complete specifications for each item. Part II shows those of special make, and the last section is devoted to useful miscellaneous notes and data, illustrating in detail the parts of the instruments described on the previous pages, with specifications and prices clearly tabulated. It is the type of equipment catalogue that thermometer users will want to file for future reference in ordering their requirements.

NEW RHODE ISLAND DYEING PLANT ESTABLISHED

The dyeing and finishing of worsted piece dyes, silk lines, dress goods and flannels will be undertaken by the Clearwater Dyeing & Finishing Company, Tarkiln, R. I., recently incorporated with a capitalization of $50,000. William F. Connor is president, Gusten Nordenstierna the secretary and Joseph Luckina the agent. Both Mr. Nordenstierna and Mr. Luckina were connected for many years with the Dunn Worsted Company, Woonsocket.

It is expected the plant, with a capacity of 10,000 yards per day, will be placed in operation this week. Besides dyeing worsteds, silks and dress goods, it will go extensively into the finishing of fancy worsteds, finishing cloth from the loom to the commission house.

TEXTILE TRADE REVIEWS OPTIMISTIC

"In some industries, now operating at near capacity, pessimism is general; in other industries, now doing fairly well, optimism is rampant and great expectations for 1927 are cheering groups which might otherwise be depressed. This latter statement applies with particular force to the textile industry, if we may think of it as one industry. The textile business has not enjoyed the growth and development which have been meted out to the metal interests during the immediate past, but we find the textile men full of hope and definitely planning for an expanding business which, even now, is in evidence."

The above is quoted from a very recent review of business conditions by Franklyn Hobbs, business analyst of the La Salle Extension University. Below is a brief extract from the same bulletin, referring more specifically to the woolen trade:

"Mill activity is increasing in wool textiles in New Jersey, eastern Pennsylvania, southeastern New York, and portions of western Massachusetts and Connecticut. Prices are firmer both in raw material and in finished fabrics."

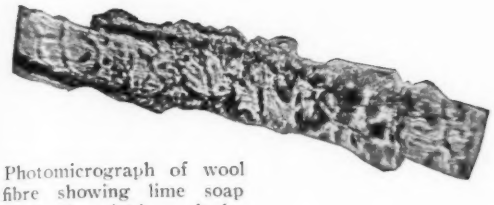
The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i. e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

DYE WORKS MANAGER

Dye works manager, at present managing large works in Britain doing almost exclusively vat colors on piece goods, yarns and artificial silk, wishes to enter first-class works in U. S. A. in similar capacity. Advertiser is 43 years of age, had first-class chemical training on Continent and is considered an expert in the application, and also manufacture, of vat colors. He has had exceptional experience in the designing and erecting of works and plants; is capable of handling large numbers of men and to take sole charge of a big concern. Firms requiring a real live wire and first-class organizer please communicate in the first place. Address Box 356, American Dyestuff Reporter.

UNUSUAL OPPORTUNITY

We have an attractive proposition for a result producer to promote the sale of our complete line of chemical textile specialties, such as Sulphonated Oils, Finishes, Softeners, etc., in Rhode Island and Connecticut. Only those fully qualified and who know how to produce need apply. All replies strictly confidential. Our organization knows of this advertisement. Reply, Box 361, American Dyestuff Reporter.



Photomicrograph of wool fibre showing lime soap curds deposited on it by the hardness in water.

This photomicrograph shows clearly how clean fibres look when processed in Permutit softened water.

Are You Being Deceived by Your Water Supply?

Water is very deceiving. It constitutes by far the biggest raw material used in most textile mills, yet not one superintendent or manager out of a hundred ever thinks to study and analyze it as other raw materials are examined. If you do, you are an exception—one out of a hundred.

Water is the greatest solvent known. It will dissolve nearly everything, with the result that it is always full of impurities. But more important than that—its composition is always changing. A good water supply today may not be so good a month hence, a soft water may slowly become hard or a hard water soft.

Examine the two highly magnified photographs of wool fibres above. The left one is coated with lime soap deposits due to scouring in hard water. Such fibres will not manufacture well, they produce faulty fabrics.

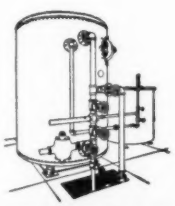
Now glance at photograph on right. Note how clean the fibre is when processed in Permutit softened water. Such fibres will manufacture into the best grades of fabrics, and they represent a very valuable improvement in manufacturing.

The mill which sent us these two samples saved thousands of dollars by properly conditioning their water supply—yet the company had operated for years on a moderately poor water supply without ever thinking to study it as other raw materials were studied.

And what about YOUR mill? Are you free from trouble in dyeing, bleaching, finishing—are you satisfied with your best grades—how much money do rejections cost YOU per year?

We are specialists in solving water problems. Our booklet "Reducing Textile Costs and Troubles" contains much valuable information about mill water supplies, that it will pay you to read. Let us send you a free copy—no obligation.

Write today.



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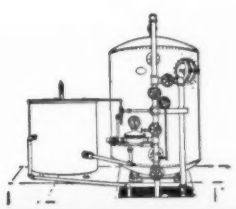

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We have specialized in the manufacture of

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Lykopon—Anhydrous Sodium Hydrosulfite for reducing indigo and vat dyes, for stripping, etc.

Formopon—Sodium Formaldehyde Sulfoxylate for discharge printing.

Indopon W—Indigo Discharge Assistant.

Formopon Extra—Basic Zinc Formaldehyde Sulfoxylate for stripping dyes.

Protolin—Soluble normal Zinc Formaldehyde Sulfoxylate for stripping dyes.

Protolin AZ—A special soluble Sulfoxylate for stripping dyes.

Our laboratory makes a special study of these products and their application, and appreciates the opportunity of co-operating with users in solving any problems which the employment of these products presents. Suggestions for stripping dyes from all classes of goods are supplied on request.

We also manufacture in our own plants a wide range of Heavy Chemicals, including Acids, Sodium Sulfide, Glauber's Salt, Aluminum Sulfate, Aluminum Chloride, liquid and crystals, Tartar Emetic, etc.

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are stable and excel any lubricant for spinning of yarns. They increase production and guarantee a perfect carding, combing and spinning.

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for winding artificial silk.

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are far more effective in thread finishing than waxes emulsified by aid of an alkali or soap.

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combines readily with all starches and far more evenly than Raw Tallow. It is neutral and non-odorous. Its ideal penetrating powers acknowledged.

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admirably adapted for tanning, dressing and finishing of all kinds of leather.

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Cowles Detergent Co.	—
David, S. R., & Co.	—
Dorr Co.	IX
Dunker & Perkins Co.	VIII
Du Pont de Nemours, E. I., & Co.	Second Cover
Dyer & Calico Printer	—
Fleischmann Co.	—
Foster, Edward C.	—
Franklin Process Co.	Third Cover
Geigy Co., Inc.	Front Cover
General Dyestuff Co.	VII
Hussong Dyeing Machine Co.	—
Innis, Speiden & Co.	XIV
International Salt Co.	—
Jennings & Co.	—
Kali Manufacturing Co.	XI
Lewis, John D.	—
Malt-Diastase Co.	XIV
National Aniline & Chemical Co.	XII
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Permutit Co.	XIII
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Sandoz Chemical Works	—
Society of Dyers and Colourists	—
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Union Color & Chemical Co.	—
United Aniline Co.	XV
United Chemical Products, Inc.	VI
Vellner, Eugene	XI
Wolf, Jacques, & Co.	—

SOLVAY

STANDARD IN SODA SINCE 1881

SOLVAY products are sold on the basis of *actual* Alkali content.

SOLVAY 58% Soda Ash *contains* 58% of *actual* sodium oxide.

SOLVAY 76% caustic soda *contains* 76% of *actual* sodium oxide.

Specify SOLVAY—the standard in SODA since 1881.

The Solvay Process Company

Detroit, Mich. Syracuse, N.Y. Hutchinson, Kans.

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U. S. P. AND TECHNICAL

POWDER OR CRYSTALS

"We are the AMERICAN MANUFACTURERS"

BRAND PENACOL MARK

PENNSYLVANIA COAL PRODUCTS COMPANY

Works: PETROLIA, PA.

Office: BUTLER, PA.

"DYE HOUSE FOG"

The Enemy of Profits

Stop the Leakage NOW—

"Dyehouse Fog" is the enemy of profits. The losses that it causes are not intermittent, but continuous. As long as you tolerate fog in your dyehouse you cannot escape them.

But you do not have to tolerate it. The Franklin Process Raw Wool Dyeing Machine will eliminate it. This machine dyes under pressure *in a closed kier.*

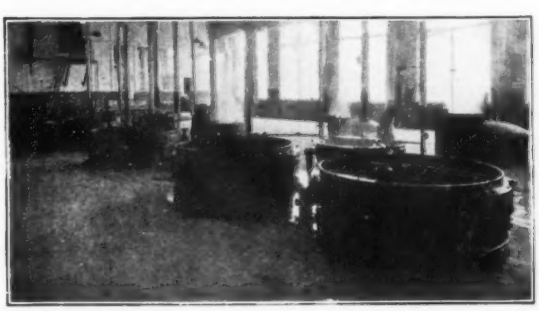
Consider the savings made possible by this improved method of raw stock dyeing. No rotted wood, rusted or corroded metal, or loosened brickwork caused by free steam. Every ounce of steam is kept at work. This method of dyeing also makes it possible to operate at 25 to 30° lower temperature than by other methods, practically eliminating all danger of tendering the stock.

Special time-saving features enable one operator, with two helpers for loading and unloading only, to run a battery of five Franklin Process Raw Stock Dyeing Machines, turning out 5000 pounds per day on chrome colors and more on mixed and union colors.

The story of the savings effected through the use of Franklin Raw Stock Dyeing Machines is told in our booklet, "An Idea — And What Came of It." Send for a copy to-day.

Several mills tell in this booklet, their experience with Franklin Process Raw Stock Dyeing Machines.

It's an exceptionally interesting story. A copy will be mailed to you, on request, free of all obligations.



The illustration above shows a battery of Franklin Process Raw Stock Dyeing Machines in operation in a well-known New England mill. Note the absence of dyehouse fog.

FRANKLIN PROCESS COMPANY

Manufacturers of Dyeing Machines, also Yarn Dyers and Manufacturers of Glazed Yarns

PROVIDENCE, RHODE ISLAND

THE NEWPORT PRODUCTS

"Coal to Dyestuff"

We produce regularly a very complete line ot dyes for all purposes

Anthrene and Thianthrene
(Vat Colors)

Direct, Acid and Chrome
Sulphur and Developed

Hydrogenated Hydrocarbons
Dyeing Assistants and Detergents

Standard quality products backed by prompt and efficient service

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TRADE MARK
"COAL TO DYESTUFF"

Newport Chemical Works, Inc.

Passaic, New Jersey

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Boston, Mass.; Providence, R. I.; Philadelphia, Pa.; Chicago, Ill.; Greensboro, N. C.; Greenville, S. C.